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Jan. 8	**"Aircraft Production Methods in America," Lecture, by R. A. Bruce, before Westland Aircraft Soc.**
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EDITORIAL COMMENT

THE air is not yet so dangerous as the road. It is pleasant to be able to write that sentence and to know that it is true. But when we ask ourselves the question "how long will it remain true?" we confess to an uneasy feeling. The carnage on the motor roads, with which the Ministry of Transport is now making a manful attempt to grapple, will not readily be surpassed. Perhaps it might be equalled if there were as many air pilots in the country as there are motorists. That, perhaps, is a distant dream—some might say a nightmare. Though small aeroplanes are getting steadily cheaper and easier to fly, there are many reasons why in Great Britain the number of pilots is unlikely to equal the number of motorists. We need not go into those reasons for the moment. The future may prove us to be wrong, but we are dealing with the present.

Dangerous Flying

In any case there is a distinct analogy between the position of motoring and that of flying. The flying community may learn lessons from a study of the lines upon which the Ministry of Transport is working in its efforts to make the roads less dangerous. It would seem that the chief cause of motor accidents is not ignorance, either of how to drive a car or of how to behave in traffic. The chief enemies of safety on the road are reckless, selfish, ungentlemanly drivers—people who know quite well what they ought to do and ought not to do, but who will not act on that knowledge. If every motorist would exercise reasonable caution, and would apply that standard maxim of the Christian and the sportsman—do as you would be done by—there would be very few road crashes.

In our last issue we published a very timely article from a correspondent on the present tendency of too many air pilots to copy the ways of the ungentlemanly motorist. They know the rules about making left-hand circuits of aerodromes before landing, and about keeping such guides as railway lines or canals on their left, etc., but they will not trouble to obey those rules. Because there are not yet very many aeroplanes in the air, these pilots usually escape

collisions; but that does not make their conduct any more excusable. Bad habits are not easily shed, once they have become second nature. The pilot who now makes a practice of flying in the wrong place and landing against the rules, will probably continue to do the same when the present number of aeroplanes has been multiplied many times; and then there will be collisions. In any case, rules should be kept, at least so long as they are not so obviously out of touch with realities as, for example, the 20-mile speed limit for cars. The rules made to control flying are not foolish and they are not onerous; therefore they should be rigidly observed by all who pretend to any sense of decent behaviour.

There is, moreover, another obligation upon pilots which does not concern motorists to anything like the same extent. Our correspondent alluded to this point also. Flying is still a débutante. The world at large has not yet made up its mind what to think about this new arrival in the society of transport. The débutante has a reputation, and it is extremely necessary that that reputation should not be compromised. The scandal-mongers are quick to seize upon any act of indiscretion, and to retail it with gusto, to the damage of the débutante's fair fame. It behoves, therefore, all the partners of the young lady to realise that while they dance with her or flirt with her they are, for the time being, the protectors and the champions of her reputation. If any one of them does anything indiscreet, Miss Flying gets talked about, and that ought not to be.

We are not now thinking of collisions, or of doing to others as you would be done by. The point now is that no pilot has any right to risk his own life and limb in an aeroplane. The rash pilot doubtless says to himself that if he chooses to risk his own life, that is the affair of nobody but himself. Such a view is not correct. His life may be valuable to nobody but himself, but to lose it in an aeroplane damages the reputation of flying, which he has no right at all to do. When flying has become as firmly established as motoring is now, then this argument will not apply; but at present it applies very strongly indeed.

A case in point is taking off when the weather is foggy or otherwise dangerous to flying. Often the temptation to "chance it" is very strong. It may require more courage to refuse to start than to run the risk of starting. The consideration that more is at stake than an individual life ought to turn the scale for prudence. To compromise the reputation of flying is an offence which should be condemned by public opinion on all aerodromes.

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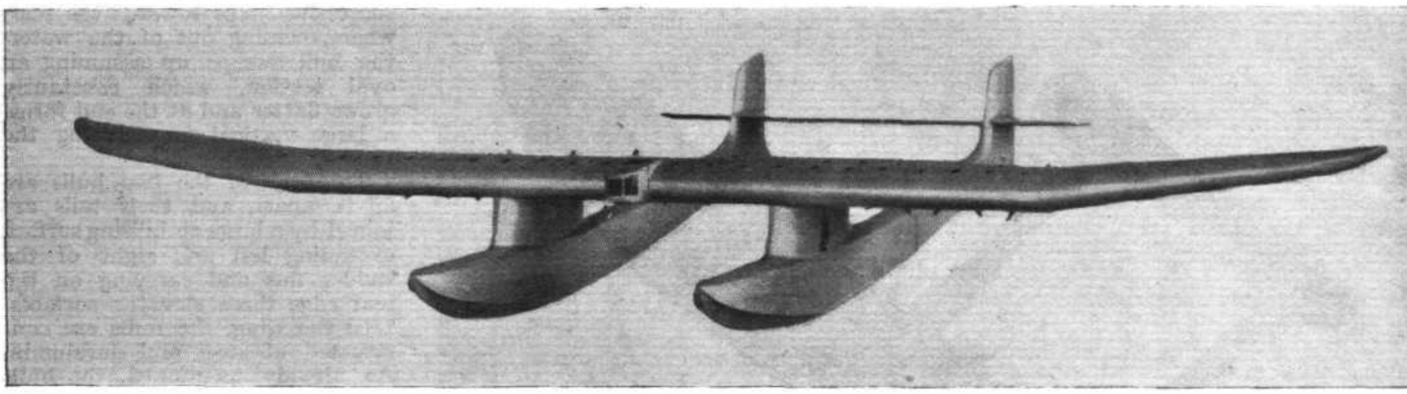
An Atlantic Air Service

So much has recently been published on the possibility of an air service across the Atlantic from Europe to the United States being opened in the near future, that it seems desirable to state briefly what the actual position is. Too much has been made of the negotiations between Pan-American Airways, the French Aero Postale, and Imperial Airways, Ltd. These negotiations do not mean that an air service from the States to Europe is imminent. They simply mean that the three firms concerned have staked their claims, and if they wish to develop them in the future, there will be no political difficulty in the way. The technical problems involved are quite another thing.

The United States Post Office has called for tenders for an air service to Europe via the Bermudas and the Azores. It is considered certain that the contract will be secured by Pan-American Airways. While the French company has landing rights at the Azores, the Bermudas are a British possession, and an American firm could not use these islands without the consent of the British Government. This consent will be granted on the condition that a British firm (Imperial Airways at once comes to mind) shall have equal facilities for flying to the United States if it desires to do so. Similar arrangements have been made as regards the French rights at the Azores, which will become available for American and British machines provided that French machines may use the Bermudas and the appropriate American airport.

There the matter stands. It has become internationally possible that all three countries may some day run air services right through from Europe to the States. Whether any one of them will do so will depend on whether seaplanes, either float planes or flying boats, can be produced which can fly the various stages with enough reserve engine power to obviate forced landings and enough lift left over for pay-load to make the service financially attractive. Without some form of assistance from the Government concerned, this is not a possibility. Either a mail contract or a subsidy or a combination of the two is an essential. Hitherto the custom of the American Post Office has been to grant a contract which gives a profit to the operating company. The Post Office pays for the air mails, and does not expect to show a profit on the transaction. The British way is for the Post Office to show a profit on the mail contract, while the Air Ministry makes up the deficit to the operating company by a direct subsidy. In either case the taxpayer has to provide the money.

It seems probable that Pan-American Airways will in the near future actually start a service from an American port to the Bermudas. The contract says this must start by next June, but no payment will be made until the through service to Europe is established. So the Bermudas service will probably be a demonstration and an experiment. In the season the tourist traffic to the islands from the U.S.A. is heavy and profitable. The mail traffic must be negligible. The distance is only some 700 miles. Such an experiment should be interesting, and might not be very ruinous if only carried on during the season. To fly the 2,000 miles on to the Azores is quite another matter. Very heavy State assistance would be needed to compensate for the smallness of the pay-load compared to the size of the machine and the weight of fuel. At present the British Government has shown no signs of offering to find funds for such a service.



Three-quarter front view of a scale model of the twin-hull Rumpler.

THE RUMPLER TWIN-HULL FLYING BOAT

Is The Giant Transocean 'Plane Coming?

By EDWIN P. A. HEINZE

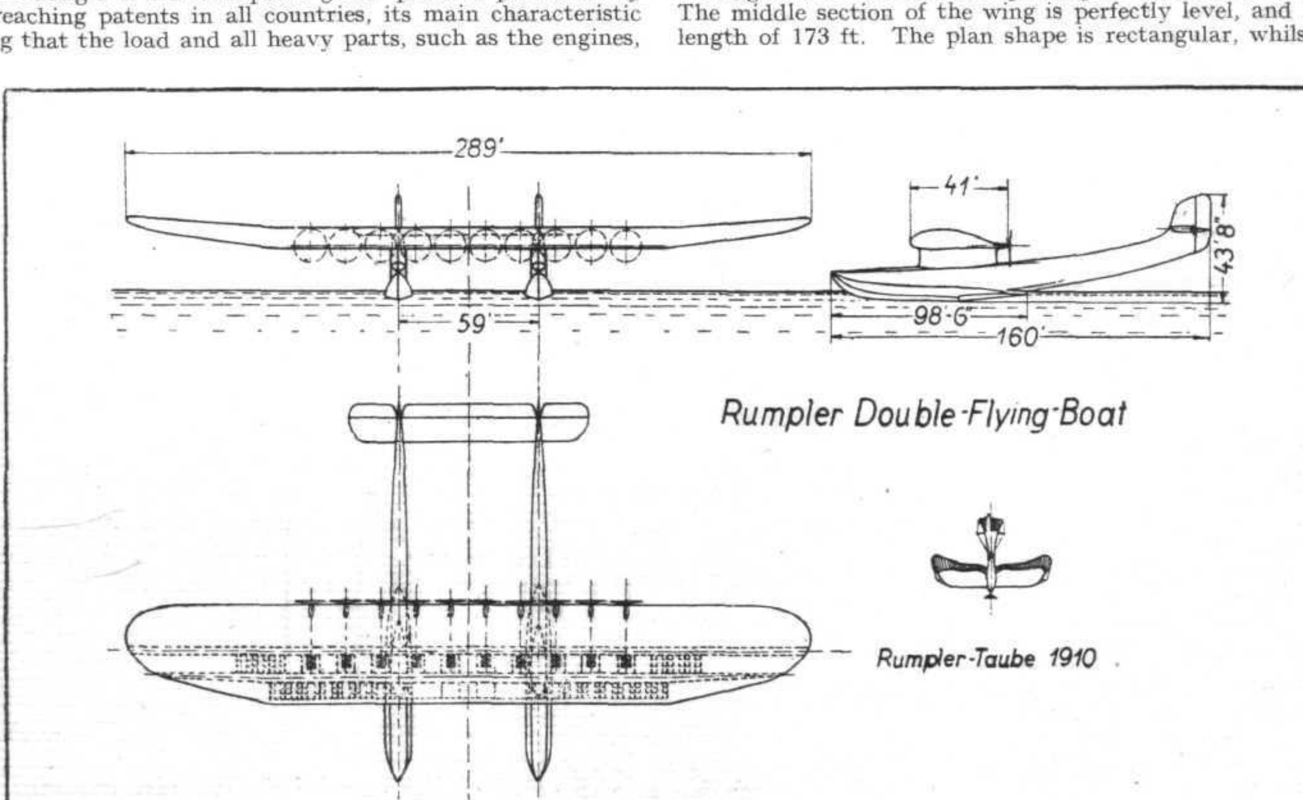
FOR years past, German aeronautical circles have been discussing the plans of Dr. Rumpler for the construction of a giant all-metal flying boat, meant for transocean service. All details of the design have been completed in ten years of consistent work, and innumerable have been the model tests and calculations carried out simultaneously with the design work at the famous Aerodynamical Institute of Göttingen, and at the Shipbuilding Institute at Hamburg. Dr. Rumpler has had the somewhat unusual satisfaction of leading German aeronautical experts of international repute giving excellent opinions on his new design after carefully studying it from all aspects. In spite of the decidedly good reception of Dr. Rumpler's ideas, it was not possible to find the necessary financial support in Germany for the construction of the 'plane.

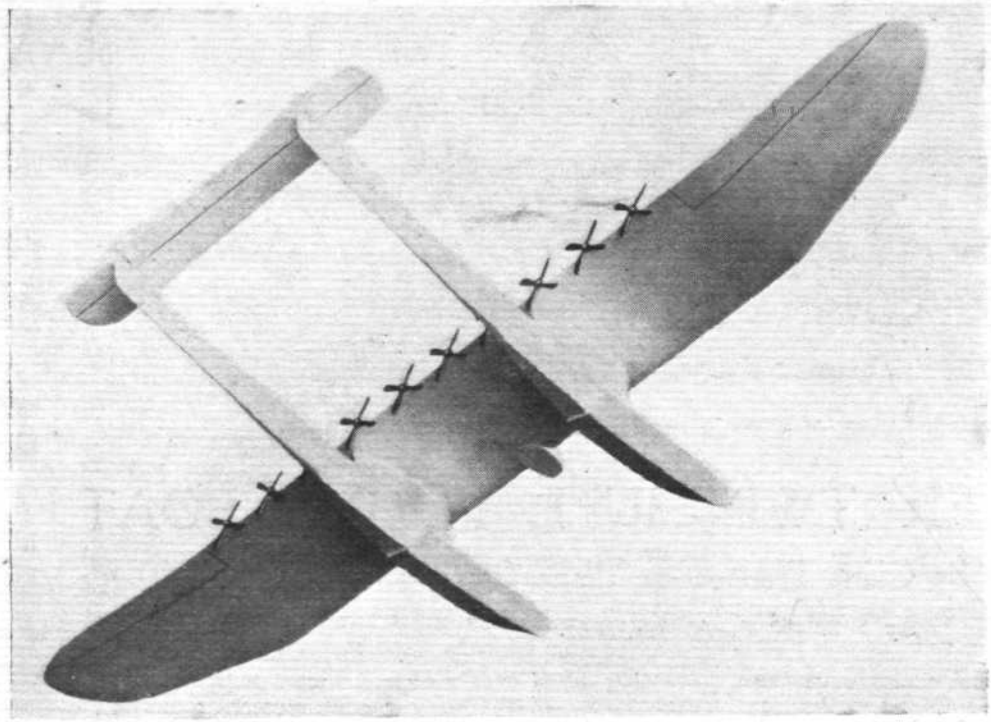
Dr. Rumpler therefore turned to America for aid, and now appears likely to receive it there, for he has been invited to the United States for preliminary negotiations by a group of financiers. If these negotiations are successful, Dr Rumpler proposes to construct the aeroplane in Germany, where the building costs would be lower than in America, and the company which is to be founded for the construction is also to operate the 'plane between Europe and North America.

The design of Dr. Rumpler's giant 'plane is protected by far-reaching patents in all countries, its main characteristic being that the load and all heavy parts, such as the engines, are distributed evenly over the whole wing surface, so that each sector of the wing carries directly a portion of the entire weight. That is, the load is decentralised. It is a well-known fact that it is impossible to increase the size of 'planes of normal type without sacrificing a disproportionate amount of the carrying capacity. The reason is that the wing spars have to be made exceedingly strong to withstand the bending strains arising from a centralised load. This is of tremendous importance, and German experts have calculated that a 'plane of the same size as the one planned by Dr. Rumpler, but built along lines to-day considered normal, would weigh anything between 8 and 10 tons more.

The machine is of the cantilever monoplane type, and the wing, resting on two hulls, contains the engines and the accommodation for the passengers and crew, whilst the petrol is located in the hulls. The adoption of two of the latter secures great lateral stability on a rough sea, and with a side-wind blowing.

The wing is built up of steel tubes braced by flat aluminium rods, and constitutes a single rigid structure, which is covered with a skin of duralumin. The total span amounts to 289 ft., with a chord of 41 ft. The tips, to a distance of approximately 58 ft. at each end, are slightly turned up and carry inside some auxiliary petrol tanks, which, however, are right away from the engines, as also from the passengers' and crew's quarters. The middle section of the wing is perfectly level, and has a length of 173 ft. The plan shape is rectangular, whilst the





View from below of a scale model of the Rumpler twin-hull flying-boat. Note the 10 pusher airscrews.

leading edges of the wing tip sections retreat. The wing tips are rounded off and merge into the ailerons, the trailing edges of which are level with the rear edge of the central wing section. The ailerons are as long as the upturned part of the wing ends. The maximum height of the central section is 8½ ft. This tapers towards the tips from the upward bend onwards.

The tubular framework of the wing is so arranged that there are two especially strong girder spars passing down the entire span of the wing. The rear one lies 21 ft. back from the leading edge, and between the two are mounted 10 engines, with an output each of 1,000 h.p. These engines are distributed evenly over the 173-ft. length of the central wing section, and are connected by means of long shafts with 10 four-bladed propellers arranged along the trailing edge.

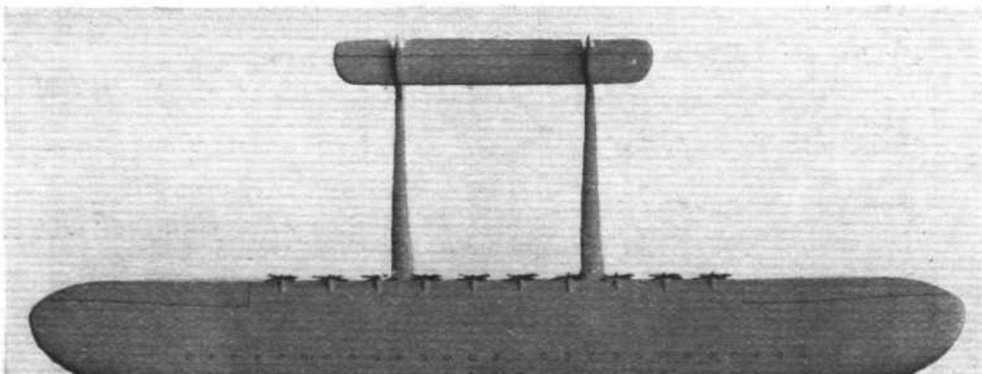
In front of the engines is a gangway 3 ft. broad and having 7½-ft. headroom. On each side of this gangway, extending over the whole span of the wing, is a partition with noise damping lining, and located in front of the forward partition are the passenger cabins. These are commodious, and contain six seats each, the measurements coinciding with the German railway standards for first-class accommodation. The crew's quarters, kitchen, etc., are located left and right of the engine room, while the navigation cabin projects forward from the centre of the leading edge. Adjoining behind are the chart and wireless rooms, as also the officers' quarters. Altogether, the wing holds accommodation for 135 passengers and 35 officers and men, besides ample room for cargo, mail and luggage.

The two hulls each have a length of 160 ft., of which 9½ ft. are submerged when the 'plane is in the water. The hulls are attached to the wing by means of streamlined turrets with doors leading out on the hull decks and having stairs inside leading up to the wing. The shape of the hulls has been carefully worked out with the aid of innumerable towing tests of models at the Shipbuilding Institute, of Hamburg. The bottom transverse section of the hulls in their forepart has a flat V-form and gradually develops into two successive steps towards the rear, where, coming out of the water, the hull sweeps up assuming an oval section, which constantly grows flatter and at the end forms a large vertical fin carrying the rudder.

The keels of the two hulls are 59 ft. apart, and their tails are joined by a large stabilising surface extending left and right of the rudder fins and carrying on the rear edge three elevator surfaces. Like the wing, the hulls are constructed of steel and duralumin. As already mentioned, the hulls carry the main petrol tanks, which are arranged so that they can be inspected, gangways for this purpose being provided. The hulls also carry such equipment and accessories as anchors, ropes, etc.

The whole 'plane fully laden ready for flight is calculated to weigh 250,000 lb., of which 143,000 lb. are useful and 44,000 lb. paying load. Besides 170 persons, it will be able to transport 13,000 lb. of mail or cargo. It is hoped to attain a cruising speed of 185 m.p.h. with it, which appears very probable in view of the fact that air resistance is reduced to a very great extent by the engines being located inside the wing and no struts and wheels being exposed to the air current. The take-off speed, it is estimated, will be about 68 m.p.h., while the ship will come down on the water with a speed of approximately 55 to 56 m.p.h. It is intended to fly the 'plane normally at an altitude between 8,000 and 13,000 ft. The peak will probably be somewhere around 16,500 ft. The total lifting area of the wing is 10,764 sq. ft., so that fully-laden the wing loading would amount to 23 lb./sq. ft.

The 'plane will be able to fly a non-stop distance of 3,700 miles, the fuel consumption being assumed as that now normal in standard aero engines. Dr. Rumpler, by the way, hopes ultimately to be able to use Diesel engines, as these work more economically, while at the same time the heavy fuel means reduced fire risks. Experience with propeller-shaft transmission for such high-power outputs is lacking in aeroplane work. The Junkers G 38 has such a type of transmission. But the shafts are very short and the engine output is much lower. The propeller-shafts of Dr. Rumpler's ship will have to be about 20 ft. long and this appears the only real difficulty in the whole design. Dr. Rumpler has designed a special transmission, incorporating large diameter hollow shafts running in self-aligning ball-bearings, and having flexible couplings at each end. Their weight is of no very



Plan view of Rumpler scale model. The span of the full-size machine will be 289 ft., and the wing area 10,764 sq. ft.

great account when it is considered that engine trestles above the wing or nacelles below it fall away in this design so that their weight is saved.

The 10,000-h.p. output of the engines comprises a big reserve, for the 'plane is capable of flying with less than 7,000 h.p., even when fully laden, at an altitude of 13,000 ft. At the beginning of the flight the power reserve amounts to 31 per cent., so that the 'plane could continue flying even if three engines fail. That is at 13,000 ft., and when going down to 3,000 ft., the power reserve would amount to as much as 40 per cent. As the machine becomes lighter the longer it flies, owing to the fuel consumption, the degree of safety constantly increases and reaches 60 per cent. towards the end of the flight. Dr. Rumpler has made up an interesting chart, demonstrating the behaviour of the 'plane in the event of a number of engines failing in succession. Supposing the 'plane is flying along at 13,000 ft., and no fewer than four engines stop work before the first 300 miles have been traversed—surely, very pessimistic !—the machine will then sink down to 8,000 ft., and again gradually climb up to 11,500 ft. before a distance of 620 miles is reached. If now a fifth engine were to fail, the 'plane would sink to 5,000 ft. and again rise to 11,500 ft. by the time it has traversed 1,500 miles, and now even a sixth engine could stop without impairing the safety of the 'plane or necessitating its going down on the water. After once more sinking to 5,000 ft., it could again climb to 8,000 ft., working with only the remaining four engines. Such a large number of engine failures are scarcely ever to be expected since it is possible to repair the engines, which are very well accessible on all sides inside the wing, during flight. Thus, the matter of safety appears very well cared for.

SOME COMMENTS ON THE RUMPLER

THIS is a day of large aircraft, and with negotiations in progress here, there and everywhere, for transoceanic air mail services, the problem of the really large and really seaworthy marine aircraft becomes more and more urgent. The Do.X has been produced and flown, but, although an extremely interesting experiment in size, that machine, as it stands, is not likely to represent the solution. We have a good deal more faith in certain large machines (although of modest weights as compared with the Do.X) now being built by such British firms as Blackburns, Shorts, and Supermarines. Great Britain has established a distinct lead in the matter of seaworthy marine aircraft, and while it would be unwise to rest content with what we have already achieved, we should not be stampeded into attempting to run before we have learnt to walk. The British flying-boat policy has been one of steady development, each step being no greater than justified by past experience. FLIGHT has consistently refused to be dazzled by mere size, and has done its best to plead for a true appreciation of the real problems involved. After all is said and done, the criterion of an aircraft is not how large a machine we can get into the air, but what is the largest size to which we can go (in our search for seaworthiness) before the useful load shrinks to a point where the resulting machine is of no practical value as a commercial transport vehicle.

In publishing our German correspondent's article on the proposed Rumpler twin-hull flying boat, we have had in mind to let FLIGHT readers know what others are doing or proposing to do. It must not necessarily be taken for granted that we believe in the success of the Rumpler scheme. In fact, we have very serious doubts on a number of points. But as it seems likely that Dr. Rumpler will find in the United States the necessary capital to realise his ambitious project, it would be well if we in this country kept in mind that Great Britain will, in the very near future, have to face serious competition in the flying-boat field. We have gained a good lead on our competitors. It is up to us to see that the advantage is not lost.

Turning to the figures quoted by Mr. Heinze for the Rumpler twin-hull flying-boat, one should bear in mind that Dr. Rumpler is one of the pioneers of German aviation, and that he would not lend his name to any project of the feasibility of which he was not personally convinced. Moreover, our correspondent points out that he has been permitted to examine expressions of opinion by a number of German scientists, Profs. Prandtl and von Karman among them, who pronounce in favour of the Rumpler design. Thus, it is with considerable diffidence that we offer the following comments on Dr. Rumpler's proposed giant.

The magnitude of the Rumpler flying-boat is little short of staggering. For example, the wing span is given as 289 ft., or very nearly twice the span of the Dornier Do.X, and the estimated gross weight is 250,000 lb., or 2½ times the greatest gross weight at which the Do.X has taken the air. The wing area is 10,764 sq. ft., as compared with 5,225 sq. ft. of the Do.X.

The criterion of an aircraft's usefulness is the amount of disposable load it will carry, taking into consideration the power of its engines. Our German correspondent states that the " useful load " is 143,000 lb. This we take to mean disposable load, as he gives 44,000 lb. as pay load. Assuming this to be correct, the tare weight of the machine is evidently 250,000 lb.—143,000 lb. or 107,000 lb. This would give a ratio of gross to tare weight of 2·338, a figure little short of staggering when we remember that an average ratio for British machines of all classes is about 1·6.

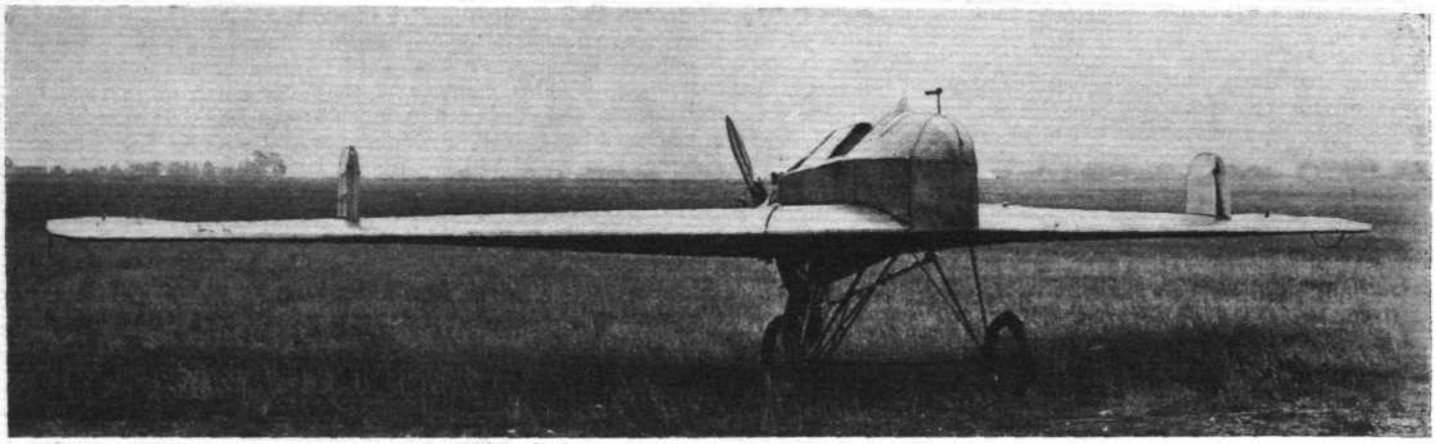
Dr. Rumpler has done his best to " cheat " the cube law by spreading his weights out over the wing, and that by doing so he has saved a very considerable amount of structure weight is not to be doubted. But that he should be able to attain such a ratio of gross weight to tare weight seems incredible. By spreading his engines along the wing, and placing the passengers inside the wing, Dr. Rumpler has doubtless been able to reduce his flying stresses in the wing, but in spite of the twin-hull arrangement the landing stresses must still be considerable. That they are smaller than would be the case in a single-hull machine may be granted.

If one examines the figures for wing loading and power loading it is found that both are high, very much higher than any British designer would be prepared to go to. The wing loading is 23·2 lb./sq. ft. and the power loading 25 lb./h.p., assuming that Dr. Rumpler can get engines of 1,000 h.p. each. While it is likely that the very size of the machine may help to make such loadings less intolerable than they would be in a smaller machine, one cannot regard them as other than prohibitive. If, on the other hand, the designer were content with either a smaller pay load or a shorter range, or both, the loading figures might come down to reasonable proportions. It is likely that the machine, if it is ever built, will be intended for trans-atlantic flying, and in that case considerable ranges will be required. The large size and twin-hull arrangement should make for seaworthiness, but it should not be forgotten that the use of two hulls will cause wracking stresses to be set up in the wing when the machine is running diagonally across the waves. There is considerable wing depth in Dr. Rumpler's machine, to be sure, but the dimensions of the hulls are correspondingly great.

Apart from these considerations of what may be regarded as the fundamentals of the Rumpler design, it is not difficult to find other somewhat problematical features. For example, the very long propeller shafts transmitting each 1,000 h.p. to airscrews placed on the trailing edge of the wing is a somewhat speculative undertaking. Resonance troubles have been encountered before now in much less ambitious lay-outs, and certainly a good deal of experimentation will be necessary before such shafts can be safely assumed to be feasible.

The distribution of the weights across the wing will doubtless reduce wing stresses and structure weights, as calculated by Dr. Rumpler, but they will also, obviously, increase the lateral moment of inertia of the machine, and the question of controllability is not one that can be ignored.

Altogether, it is difficult not to feel a certain amount of misgivings concerning the new giant Rumpler machine. But as we said at the beginning of these comments, we are informed that the subject has been extremely carefully studied by some of the best brains in Germany, and such criticisms as we have offered are presented with all diffidence. They merely express the reaction of minds accustomed to thinking in terms of British sizes and loadings.



THE SOLDENHOF TAILLESS 'PLANE

A Swiss Light 'Plane Two-Seater

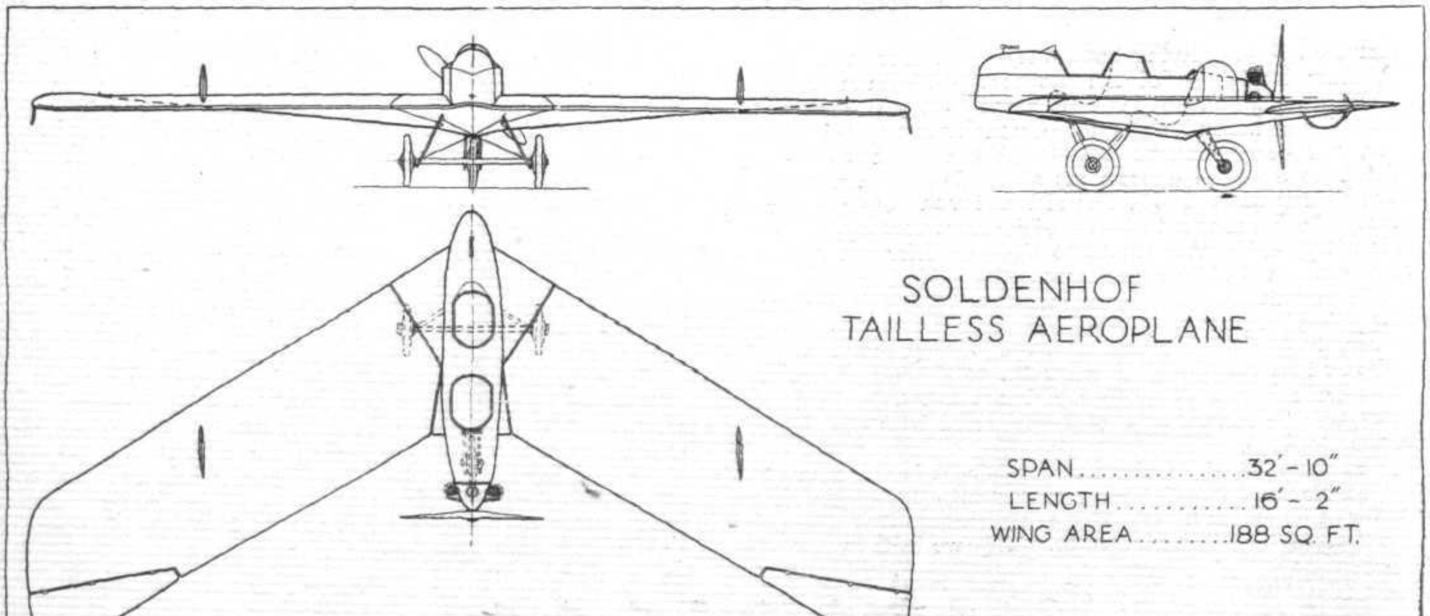
STALLING and spinning are still the two dangers of flying, and in seeking to avoid them aircraft designers may be said to have adopted three distinct means of cure: The Handley Page automatic wing tip slot (which checks the incipient spin but does not prevent the stall), the "tail-first" or "Ente" lifting surface arrangement, and the "tailless" machine. The Handley Page slots are, of course, well known to readers of FLIGHT. They have robbed stalling of much of its danger, because a machine fitted with them does not flick into a spin when it is stalled. The tail-first or "Ente" ("Duck") principle has been revived in Germany recently by the Focke-Wulf firm, whose latest "Ente" has passed its tests with flying colours and is now passed by the German authorities for passenger-carrying. The tailless type of aircraft was reintroduced by Captain Hill in England some years ago, and Captain Hill has, with the assistance of the Westland Aircraft Works, continued his experiments and researches with machines known as the "Pterodactyl" series. A three-seater machine of the tailless type is now in course of construction at Yeovil.

In the meantime a Swiss engineer by the name of Soldenhof has also been experimenting with tailless aircraft, and has now reached the stage where he is ready to market his machine, one of which is shown in the accompanying illustrations.

Before building his full-size machine Herr Soldenhof had wind tunnel tests made on models, and these indicated that the wing arrangement chosen, *i.e.*, with a pronounced "wash-out" towards the wing tips, has given a perfectly stationary centre of pressure, although the wing section employed is not in itself one of the stationary c.p. types. The fundamental principle of the Soldenhof machine is the same as that used by Captain Hill in his "Pterodactyls," *i.e.*, a pronounced sweep-back combined with a "wash-out," or reduction in angle of incidence from centre of wing to wing tips. The forward, central part of the wing thus reaches its maximum lift before the wing tips do, and the nose of the machine drops before the complete wing is stalled. Tunnel tests on the Soldenhof are reported to have shown that the maximum L/D of the machine is 18, which is a high figure in view of the relatively low aspect ratio.

As marketed the Soldenhof machine will be a two-seater light 'plane, fitted with 40 h.p. Salmson radial air-cooled engine. The tare weight is given as 240 kg. (528 lb.) and the gross weight as 450 kg. (990 lb.). The maximum speed is approximately 100 m.p.h., and the range about 450 miles.

Those interested are advised to write to Mr. C. Guggenheim, The Star Hotel, 30, Charlotte Street, London, W.1.



THE "ROBUR" PARACHUTE

SINCE we last described (about 18 months ago) the "Robur" parachute, which is manufactured by Carl H. Lundholm, Aktiebolag, of Stockholm, considerable progress has been made with this parachute. After strenuous work, spread over a great number of years, the manufacturers have now produced a parachute which they have perfected to a degree of satisfaction to warrant its production in the open market of the world.

The first country which has adopted it for its Air Force is Holland, and as the Royal Dutch Air Force is generally recognised as a very efficient one, the adoption of the "Robur" indicates that this parachute possesses successful features.

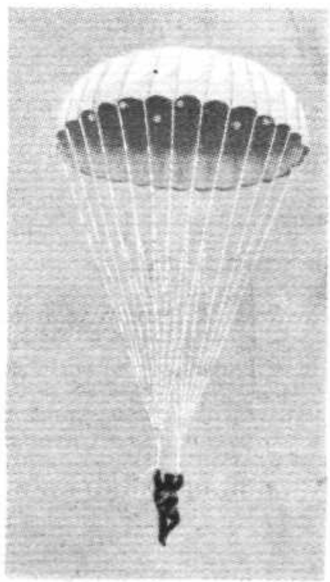
It will be recalled that the "Robur" was developed from the "Thornblad," an automatic-type parachute; the makers, it may be added, favour the automatic system as compared with the manual type. The question of "automatic" or "manual" parachutes is one that has been—and, we are inclined to think, always will be—debated upon at great length. We do not propose to enter upon a discussion here regarding which is best, for although it is true that the manual type is, perhaps, in more general use to-day, we feel that both systems, in the present state of development, possess individual advantages, and, after considering all the "pros and cons," they present a "six of one and half a dozen of the other" aspect.

In designing the "Robur" parachute the makers have evidently taken the same view, for they have not only acted upon the principle that a parachute should, if possible, be suitable for use by everybody without previous practice, even if the physical and mental state of mind of the user should be detrimentally affected at the moment of jumping; but, in addition, they hold that a parachute must also afford life-saving possibilities if an automatic function should be impossible—or, in other words, the manual release is also to be desired.

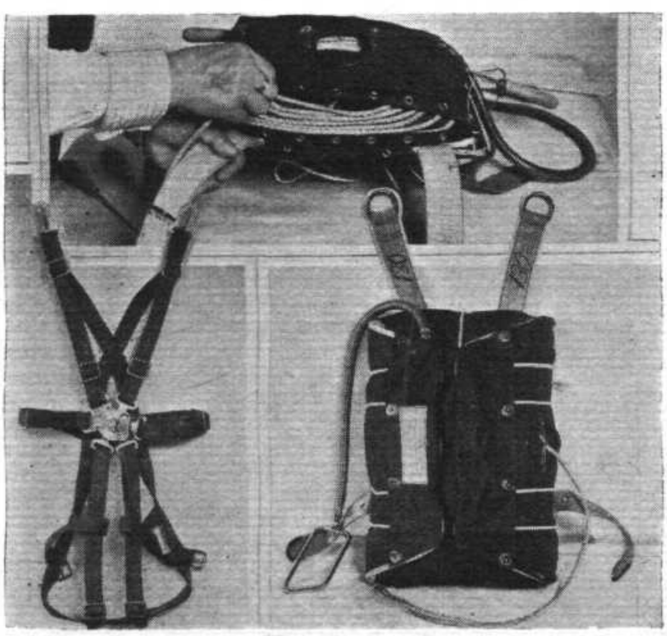
On the basis of these principles the "Robur" has been fitted with both kinds of release, and while the manual device is completely reliable, the makers strongly recommend that the parachute should be allowed to function automatically whenever possible, and the manual release should be resorted to only when the static line is not attached to the aircraft.

The most important feature of the "Robur" parachute—a patented one which is claimed to have eliminated all risks in using a parachute automatically—is that the static line is packed in a closed pocket or chamber on the container in such a manner that the chamber opens only after the jump, and the static line effects the release mechanism only when fully stretched; the length of the static line is, of course, such that the parachute opens only when the jumper is well clear of the aircraft.

Two views showing how the "Robur" parachute is worn.



The "Robur" parachute, showing the apertures in the canopy; below, three views of the pack and harness showing (in top picture) the static line in its pocket.



The parachute pack is also constructed on a new patented principle; it consists of inner and outer chambers, the former containing the canopy together with shroud lines, and the latter holding the pilot 'chute. The inner chamber is covered by four flaps provisionally held together, and the outer chamber by two flaps and a locking plate between them. The combined release, briefly explained, may be said to comprise a series of cone-fasteners connected respectively to the end of the static line and the manual operating line—which terminates in a ring on the breast of the user. The operation of the parachute is as follows:—With automatic release, the free end of the static line is secured to a firm spot in the cockpit, and when the user jumps, the static line first opens its container and is then pulled, progressively, out as the user falls away from the machine. When the line is fully stretched it is pulled away from its connection with the cones on the locking plate (and, incidentally, remains with the aircraft), and the two outer flaps of the pack are opened (by elastic means). A small pilot 'chute is then released, opening the inner chamber and freeing the main 'chute, which then fully develops.

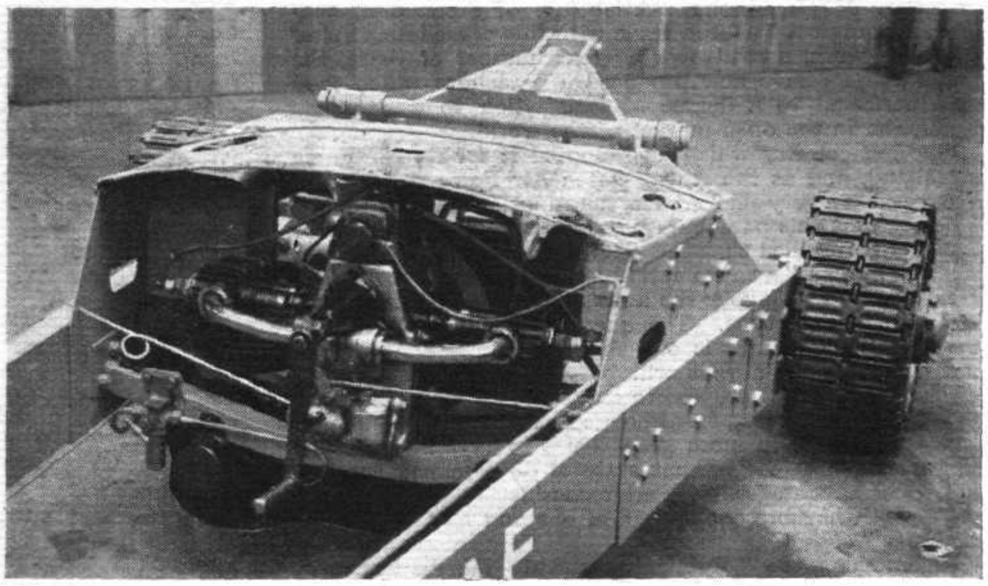
When a manual operation is desired, the aviator (when, of course, well clear of the machine) pulls the ring at his breast, which releases the catches on the locking plate and releases the pilot and main 'chutes in the same manner as described above; naturally, in this case the static line is not attached to the aircraft.

Other features of the "Robur" parachute to which we can only but briefly refer, are to be found in the main 'chute or canopy, and the harness. As regards the former, this is provided with a series of apertures round its centre, which it is claimed not only reduce the opening shock, but contribute to stabilising the descent and also decrease the rate of descent rather than increase it.

Finally, two new types of harness have been designed, the first one having all free ends joined in one central release in front, so that it is possible to get free from the harness by one movement of the hand; in the second type two disconnectors are placed on the breast of the wearer, which enable a quick detachment from the harness, a new type of safety catch preventing premature opening.

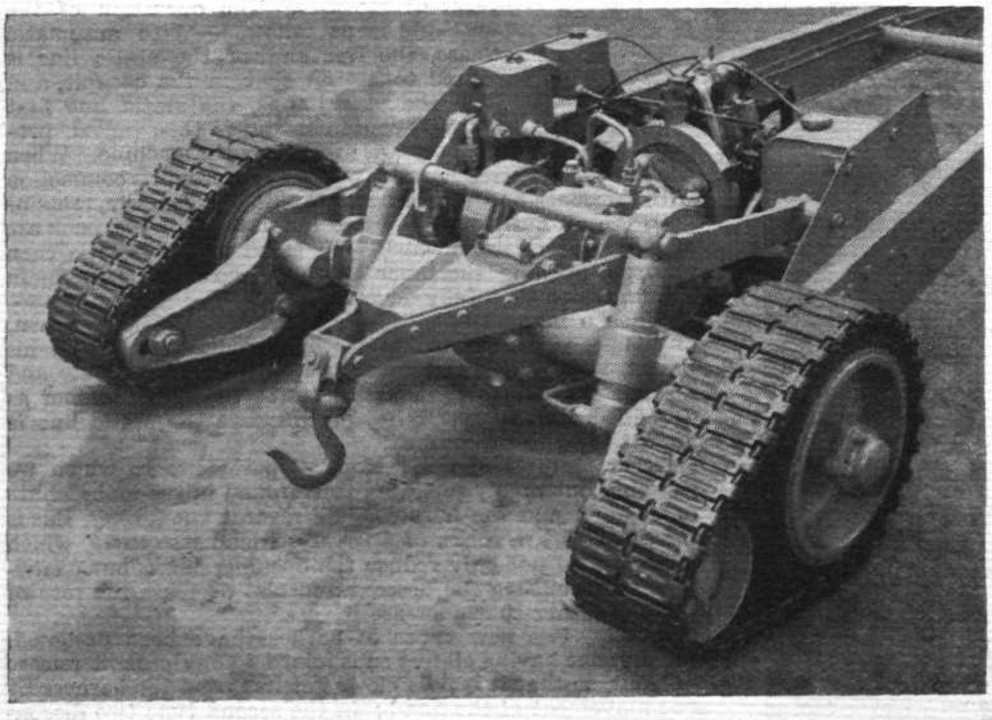
A POWER-DRIVEN TAIL TROLLEY

SHELVOKE AND DRURY, of Letchworth, Herts, have delivered an extremely interesting and efficient power-driven tail trolley to the Royal Air Force. As will be seen from the photographs, this consists essentially of two long ash beams in the form of a "V" with a heavily-built axle crossing the broad end. The axle terminates in two pairs of 15 in. by 3 in. solid rubber-tyred wheels which carry a duplex flat chain track, and each track is tensioned by means of a smaller pair of jockey wheels in front of the main wheels forming, in effect, two wedge-shaped caterpillar tracks. Between the axle and the beams is supported a Coventry Victor 5-6 h.p. flat twin air-cooled motor. This is laid parallel to the axle and small fins are arranged on the flywheel to form a fan for cooling purposes. An extension of the crankshaft goes from the flywheel and first drives an oil pressure pump, then an epicyclic gear-box having one forward and one reverse speed, each of which can be coupled up by a very simple multiple dry plate clutch either side by the box. The drive from the box to the back axle is by normal straight bevel gearing, and the axle itself drives the wheels at its ends by a spur wheel engaging in the internal teeth inside the wheel. The brakes for operating the forward or reverse speeds are actuated by a simple lever at the apex of the beams, so arranged that when the driver pushes a cross-bar on this lever away from him the forward speed is connected, and in a similar way, when he pulls it towards him, the reverse speed is connected, so that the trolley moves in whichever way he moves this cross-bar. The engine installation is very simple. A small petrol tank of approximately 1 gallon is situated on one side and a small lubricating oil tank on the other. The induction side of the engine from which the starting handle projects is therefore perfectly free and facing the driver between the beams; the magneto is situated on the top of the engine leaving the contact breaker perfectly clear for inspection, while the carburettor is just below the handle in an accessible position.

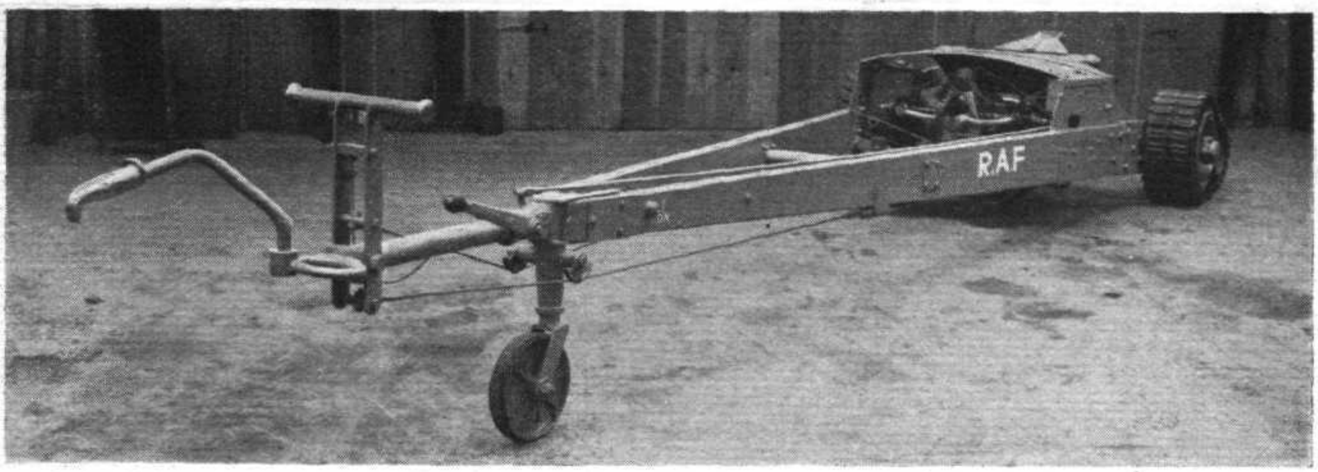


A view from the driver's end showing the Coventry-Victor air-cooled engine with the accessible starting handle, carburettor and petrol filter, the latter being at the bottom left-hand corner of the engine mounting. (FLIGHT *Photo*.).

There is a petrol filter in the lead from the tank to the carburettor also situated to one side of the engine where it can easily be got at. At either side of the back axle are two rams actuated by the oil pressure pump which we mentioned before as being in between the gear-box and the engine. There is a small tank for replenishing the system, and a valve which the driver can operate from the far end of the trolley, allows the pressure from the pump to be directed to the bottom of the rams or bye-passed back to the suction side of the pump when no movement of the rams is required, and similarly, the reverse position allows the oil from beneath the rams to flow back into the system when it is desired to lower them. These rams are connected by a heavy steel cross-bar, and this cross-bar goes through two bearings attached to either side of a heavy steel "V." The inner ends of this "V" are connected to bearings attached to the main body of the trolley, while at its apex there is a swivelling hook so arranged that it can be hooked into the ring of the aircraft which it is desired to transport. A lift of 16-in. is allowed for at the hook which should be amply sufficient to ensure that the tail skid is high enough even on very rough ground. As will be seen, the whole outfit has been designed so that it is very simple and can easily be operated by one man at the end where he has his lever controlling the forward or reverse motion in a convenient position. At the centre of this lever is a small thumb-operated throttle for the engine, while close to his right hand there is the lever which raises or lowers the rams, the by-pass position of the valve is of course automatically set when the ram is at the top of its travel, and a little further down one beam is the cut-out switch for the ignition system of the engine. This driving head, as it were, is carried on one small castor wheel which allows very easy manipulation, and the length of the beams allows the driver to swing the tail round with great ease. This model has been designed for aircraft weighing up to 6 tons and with a load of up to 1,200 lb. on the tail skid under normal conditions, and an indication of its capabilities is given by the fact that the works'



The other side of the engine showing the caterpillar tracks, lifting rams and hook for the tail skid. The engine cover can easily be lifted for inspection. (FLIGHT *Photo*.).



A complete view of the trolley. The cross-bar operating forward or reverse gear comes conveniently to the driver's hand as he pushes or pulls. (FLIGHT *Photo.*)

test is for it to pull a 4-ton load up a rough sleeper track having a gradient of 1 in 18. This model was, of course, built to Air Ministry specification and every care has been taken that it is capable of being placed in position on all aircraft, whatever type of rudder or tail plane bracing they may have, and because of this everything has been kept very low indeed. A range of push or pull of 100 deg. was called for on either side of the tail skid. Although this trolley is primarily designed for use in the R.A.F. we certainly think that it would be a very paying investment not only for the commercial operating companies, such as those at Croydon who are constantly handling large machines but also for our large aircraft constructors, many of whom would welcome this type of tail trolley whereby they could shift their machines even on a comparatively soft aerodrome with one man instead of having to disorganise the works temporarily while a large squad is called out to push and pull in the mud.

THE G.A.P.A.N.

THE following additional report has been received from the Clerk of the Guild :—

Further to the Annual Report, I am now in a position to inform you that the Court for 1930–1 stands as follows :—

MASTER.

DEPUTY MASTER.
Sqd.-Ldr. the Rt. Hon. F. E. Guest, C.B.E., D.S.O.

HONORARY WARDENS.
Her Grace the Duchess of Bedford, D.B.E.
Sir Alan Anderson, K.B.E.
C. R. Fairey, Esq., M.B.E., F.R.Ae.S.
Sqdn.-Ldr. the Rt. Hon. F. E. Guest, C.B.E., D.S.O.
Maj. Norman Holden, LL.B.
The Rt. Hon. Viscount Rothermere.
Baron Wakefield of Hythe, C.B.E., LL.D., Hon. F.R.Ae.S.
The Rt. Hon. Lord Weir of Eastwood.

WARDENS.
Capt. A. G. Lamplugh, A.F.R.Ae.S., M.I.Ae.E., F.R.G.S.
Capt. Norman Macmillan, M.C., A.F.C., A.F.R.Ae.S.
Capt. C. R. McMullin.
A. S. Wilcockson, Esq.

MEMBERS OF THE COURT.
Flt.-Lt. G. Birkett.
Sir Alan J. Cobham, K.B.E., A.F.C.
Capt. J. B. L. H. Cordes.
Flt.-Lt. H. D. Davis, A.F.C.
Sqdn.-Ldr. R. A. de Haga Haig, A.F.C., A.F.R.Ae.S.
F. Dismore, Esq., Ordre Leopold II (Belgium).
Capt. W. L. Hope.
F./O. F. A. Jones.
Capt. O. P. Jones.
C. A. Pike, Esq.
F./O. H. H. Perry.
Col. the Master of Sempill, A.F.C., F.R.Ae.S.
Capt. F. Tymms, M.C., Chevalier de L'Ordre de la Courounne Croix de Guerre, A.F.R.Ae.S.
L. A. Walters, Esq.
The Rev. P. D. Robins, A.F.C. (Chaplain).

A meeting of the Court was held on the 4th instant. Some of the matters discussed were : Navigation Classes, Aerodrome Rules, and Licences.

The Guild are being represented at the Safety Congress in Paris, and papers have been submitted by the Clerk and Capt. N. Macmillan. Representatives were sent to an informal meeting of pilots of several European countries with a view to discussion of matters of common interest.

The Guild report that an appeal has recently been made to members and friends for a memorial to the late Sqdn.-Ldr. Johnston, and it is suggested that the money should be utilised to purchase a trophy, to be awarded annually for the best feat of civil air navigation.

It was unanimously resolved that Mrs. Johnston, the widow of the late Deputy Master, should be elected an honorary member of the Guild.

Owing to the number of communications the Guild have received regarding the question of navigation classes, they desire to state that it is intended to extend its activities in this connection to the provinces, to cope with the demand, but it has not yet been definitely decided in what towns they shall be held. Fuller information on this question will be given shortly.

The Guild would again like to take this opportunity of referring to its Employment Bureau. On the register there are 25 to 30 pilots looking for suitable positions. The Guild state that they are in a position to fill any vacancy immediately, on enquiry of the Secretary, and firms are requested to make a note of this facility.

Whitaker's Almanack, 1931

"I REVEL in a banquet of unmitigated fact," wrote the late A. G. Godley about the "Oxford University Gazette." The line would apply equally well to Whitaker's Almanack. The labour entailed in collecting such great numbers of facts must be immense. We imagine that when the facts have been collected, the temptation to enlarge on them must be great. If so, it is sternly and wisely suppressed. One only goes to "Whitaker's" for facts, and it is because one finds them put succinctly that one values the volume so highly. The 1931 edition is even better than its predecessors, and in particular we appreciate the collection of useful statistics about flying which fill pages 596-7-8.

Navigation Lectures

READERS should make a particular note of January 6, as on this date the Navigation Lectures held at Air Ministry, Gwydr House, Whitehall, under the auspices of the Guild of Air Pilots and Air Navigators of the British Empire, in preparation for the examination to be held next March for second-class Navigators' Licences, will be resumed after the break for the Christmas holidays.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

REPORT of Meeting of the Committee of the Royal Aero Club, held at 3, Clifford Street, London, W.1, on Wednesday, December 10, 1930, at 5.30 p.m.

Present :—Col. F. Lindsay Lloyd, C.M.G., C.B.E., in the Chair; Griffith Brewer; Lieut.-Col. M. O. Darby, O.B.E.; W. Lindsay Everard, M.P.; Maj. Alan R. Goodfellow; John Lord; F. Handley Page, C.B.E.; Maj. H. A. Petre, D.S.O., M.C.; Capt. C. B. Wilson, M.C.; H. E. Perrin, Secretary.

Election of Members.—The following new members were elected :—Flying Officer Patrick Charles Ibbetson Elderton, Flying Officer Geoffrey Francis, John Egerton Harrison, Lieut.-Col. Frank Yeigh McEachren, Maj. Charles Kennedy, Cochran-Patrick, Flying Officer Havelock Clive-Smith, Charles Edward Ward, Capt. Leo Patrick Winters.

Gliding Certificates.

THE following Gliding Certificates were granted :—

38	Montgomery H. Thomson ..	Surrey Gliding Club.
39	William G. Nicholls ..	.. Kent Gliding Club.
40	Thomas C. Weekes ..	.. Kent Gliding Club.
41	Harold E. Wood ..	.. Kent Gliding Club.
42	Harold J. Penrose ..	.. Dorset Gliding Club.
43	Stanilaus E. Wells ..	.. Dorset Gliding Club.
44	Henry J. Secker ..	.. Dorset Gliding Club.
45	Victor S. Gaunt ..	.. Dorset Gliding Club.
46	Frederick J. W. Wingfield Digby	Dorset Gliding Club.
47	William G. Gibson ..	.. Dorset Gliding Club.
48	Gurney Grice.. ..	.. London Gliding Club.
49	Mary Douglas Nicol	.. London Gliding Club.
50	Maurice E. Holroyd	.. Dorset Gliding Club.
51	Norman W. Wright	.. Dorset Gliding Club.
52	Joseph T. Young ..	.. Driffield & District Gliding Club.
53	Donald C. Smith ..	.. London Gliding Club.
54	George H. Taylor ..	.. Surrey Gliding Club.
55	Robert B. Batchelor	.. Driffield & District Gliding Club.
56	John G. H. Steedman	.. Dorset Gliding Club.
57	Lee R. L. Brown ..	.. Southdown Skysailing Club.
58	Frederic Pilling ..	.. Surrey Gliding Club.
59	Henry Petre	.. London Gliding Club.
60	John Laver	.. Dorset Gliding Club.
61	Charles C. Russell ..	.. Southdown Skysailing Club.

Aviators' Certificates.

THE following Aviators' Certificates were granted :—

9595	Thomas Alton	.. Newcastle Ae.C.
9596	Thomas C. Fawcett ..	.. Newcastle Ae.C.
9597	Norman Fawkes ..	.. Newcastle Ae.C.
9598	Thomas Alan Carr ..	.. Newcastle Ae.C.
9599	Henry N. S. Gleadow	.. Hull Ae.C. (N.F.S.).
9600	Finch White	.. Hanworth Club (N.F.S.)
9601	Donald Garth Ross ..	.. Cinque Ports Fl. C.
9602	Fidelia Josephine Crossley..	Airwork Fl. School.
9603	Fred Brookes ..	.. Brooklands Fl. School.
9604	Benjamin Innes Shayer	.. Hampshire Ae.C.
9605	George Neville Beaumont ..	—
9606	Harold Ashley Brock	.. Airwork Fl. School.
9607	Ahmed Ali Salem ..	.. Marshall's Fl. School.
9608	Francis William Armitage ..	Marshall's Fl. School.
9609	Jean Gardner Batten	.. London Ae.C.
9610	John William Craigie	.. Scottish Fl. C.
9611	Cecil Giesler Norbury	.. Brooklands Fl. School.
9612	Geoffrey C. H. Dorman ..	—
9613	Lennox A. K. Boswell	.. Hampshire Ae.C.
9614	Siang Tsi Sun ..	.. Cinque Ports Fl. C.
9615	Barrie Seymour Nicoll	.. Airwork Fl. School.
9616	Thomas Richard Oliver	.. Hull Ae.C. (N.F.S.).
9617	Thomas Julian Hollinrake ..	London Ae.C.
9618	Marion Ogilvie-Forbes	.. London Ae. C.
9619	Harold Horace Taylor	.. London Ae.C.
9620	Antoria Marian Gamwell	.. Hanworth Club (N.F.S.)
9621	Annie Hope Gamwell	.. Hanworth Club (N.F.S.)
9622	Gerald Vyvian Williamson ..	Yorkshire Ae.C. (N.F.S.)
9623	Thomas Bancroft ..	.. North Sea Aerial & Gen. Transport, Ltd.
9624	Sydney Hargreaves ..	.. Hanworth Club (N.F.S.)
9625	Humphrey R. Hughes-Hallett	Phillips & Powis Fl. S.
9626	Arthur Earnshaw ..	.. Hull Ae.C. (N.F.S.).
9627	Henry Proctor ..	.. Newcastle Ae.C.
9628	Arthur P. C. Wigan	.. Newcastle Ae.C.
9629	Charles Derek Pitman	.. De Havilland Fl. School.
9630	Enid Beatrice Loyd	.. Airwork Fl. School.
9631	Charles Montgomery	.. Hampshire Ae.C.
9632	Geoffrey Phillip Taylor	.. Henderson Aviation Bureau.
9633	James Bryan Upton	.. Hull Ae.C. (N.F.S.).
9634	Peter W. J. Pharazyn	.. Marshall's Fl. School.
9635	Robert Lewis Baker	.. De Havilland Fl. School.
9636	Rosalie Helen Sinclair	.. London Ae.C.
9637	Horace Sinclair ..	.. Hanworth Club (N.F.S.)

F.A.I. Conferences, Paris.—The report of Lieut.-Col. M. O'Gorman on the conferences of the F.A.I. held in Paris on November 29 to December 2, 1930, was submitted.

A vote of thanks was passed to Col. O'Gorman and Maj. C. J. W. Darwin for representing the club at these conferences.

King's Cup Air Race, 1931.—The recommendations of the Racing Committee for next year's race were considered and approved for submission to His Majesty the King.

Offices : THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W.1.
H. E. PERRIN, Secretary.

T.M.A.C. Indoor Flying

THE following dates next year have provisionally been fixed for the indoor flying meetings of the Model Aircraft Club (T.M.A.C.): January 7, 28; February 11, 18, 25; March 11, 18, and 25. These meetings are held at the Royal Horticultural Hall, Vincent Square, Westminster, S.W.1, from 7 to 9 p.m. Should the hall, however, be required for any other purpose on any of these dates, previous notice will be given, if possible.

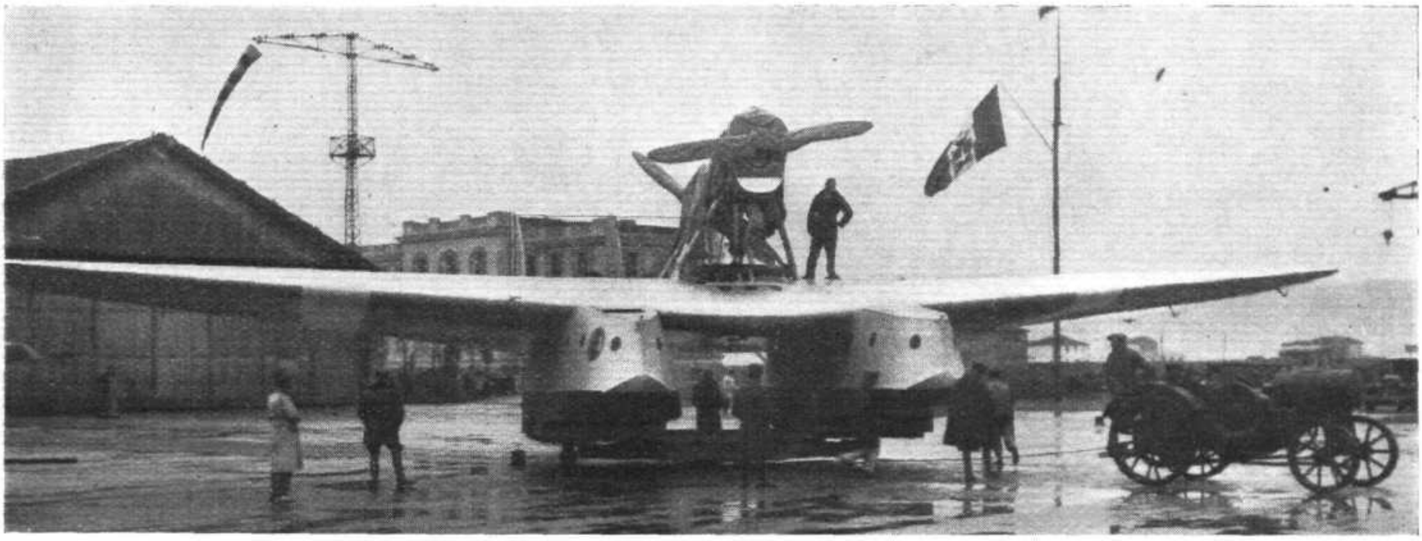
The Segrave Memorial Trophy

THE Segrave Memorial Fund has now been closed, the donations received, which were headed by H.R.H. the Prince of Wales, being adequate to secure the ends which the original signatories to the memorandum had in view. The constitution of the trophy, which has been settled by the Segrave Memorial Fund Committee, provides for the setting up of an Awarding Committee, consisting of representatives of the Royal Automobile Club, the Royal Aero Club, the Marine Motoring Association, the Newspaper Proprietors' Association, the Institution of Mechanical Engineers, the Royal Aeronautical Society, and the Institution of Automobile Engineers. This committee will sit each January to review the achievements of the previous year, and the award will be made to the British subject of either sex who, in the judgment of the Awarding Committee, has accomplished the most outstanding demonstration of the possibilities of transport by land, air, or water.

Meteorological Office. Professional Notes No. 59

OBSERVATIONS of temperature in the upper air are of considerable importance in meteorology both on account of their theoretical value and also by virtue of their practical appoication to daily forecasting. Few such observations are available from Iraq and hence special interest attaches to those made there by aeroplane which are recorded and discussed in this note, which reveals conditions regarding the vertical distribution of temperature over Iraq, which are markedly different from those usually met with in this country, and a knowledge of the occurrence of such conditions, is of practical importance in air navigation. Copies of the note, price *3d.* net, may be obtained through any bookseller or directly from H.M. Stationery Office.

AIRISMS FROM THE FOUR WINDS



THE ITALIAN SQUADRON'S ATLANTIC FLIGHT: As reported below the twelve Italian Savoia S.55 flying-boats left Orbetello, under the leadership of Gen. Balbo, on December 17. The above picture shows one of the flying-boats being "tractored" to the water. In the lower picture we see a final inspection being made before the start of the two Fiat A22R engines in one of the boats.

The Italian Formation Atlantic Flight

Just before 8 a.m. on December 17 the twelve Italian seaplanes, under the leadership of General Balbo, Italian Air Minister, together with two repair 'planes, set out from Orbetello on the first stage of their 6,400-mile flight to Brazil. The machines are Savoia S.55 twin-hull, twin-engined monoplane flying-boat bombers, slightly modified for long-distance flying. Each is fitted with two Fiat A22 R 12-cyl. 560-600-h.p. engines, and is equipped with long and short-wave wireless installation, and special lighting system for landing at night. The total loaded weight of each machine is 10,000 kg. (22,050 lb.), of which 4,800 kg. (10,584 lb.) is

useful load. The personnel of each boat comprises four, two pilots, a mechanic, and a wireless operator, all having volunteered for the flight. The flight to Rio de Janeiro will be divided into seven stages, as follows:—Cartagena, Kenitra (Spanish Morocco), Villa Cisneros, Bolama, Port Natal, Bahia and Rio; the longest "hop" will be across the Atlantic from Bolama to Port Natal, 1,800 miles, and seven fast naval scout ships will be posted along this section to render assistance if necessary. In addition to Gen. Balbo the pilots include Gen. Valle, Aeronautical Chief of Staff, and Col. Maddalena. The twelve Savoia flying-boats left Orbetello in flights of three at short intervals, and after circling overhead flew off in squadron formation. Some five hours later, however, they encountered a violent storm over the Balearic Isles and alighted near Majorca. Eight of the machines were able to proceed to Cartagena, but the others, including Gen. Balbo's, were unable to get away. These were storm-bound until December 20, when they were able to rejoin the squadron at Cartagena. The squadron resumed the flight next day and reached Kenitra, Morocco, in the afternoon.

The R.A.F. 1931 Cape Flight

It has already been announced that the R.A.F. annual flight from Cairo to Capetown and back, in 1931, will be undertaken by No. 216 (Bomber) Squadron, which is stationed at Heliopolis. The squadron is equipped with Victoria troop-carrier aeroplanes, each driven by two Napier Lion XIA engines. The squadron is commanded by Wing Commander E. A. B. Rice, M.C., and rejoices in two squadron leaders, namely, E. R. Pretyman, A.F.C., and H. W. G. J. Penderel, M.C. The last-named will command the Cape flight, which will include our old friend Flt.-Lt. D. D'A. A. Greig, D.F.C., A.F.C., of high-speed flight fame. We wonder how he likes flying a Victoria after an S.5! The Cape Flight will consist of three Victorias flying in formation. Such large aircraft have never, we believe, been seen in South Africa before, and the flight should make a very imposing sight. The previous R.A.F. flights to the Cape have all, if we remember right, been made in Fairey two-seaters, either IIID or IIIF machines, so that the advent of the huge Vickers troop carriers will be sure to make a sensation, and suggest thoughts of carrying reinforcements about the Empire in time of need. The flight is due to leave Heliopolis on January 12, and is expected to arrive at Capetown in the first week of February. The route will be:—Wadi Halfa, Khartum, Malakal, Juba, Entebbe, Nairobi, Tabora, Abercorn, Broken Hill, Livingstone, Buluwayo, Pretoria, Bloemfontein, Beaufort West, Capetown. Exercises in carrying troops will be undertaken at Entebbe and Nairobi. The return route will be:—Victoria West, Kimberley, Pretoria (or Johannesburg), Pietersburg, Buluwayo, Salisbury, Broken Hill, M'Pika, M'Beya, Dodoma, Nairobi, Entebbe, Juba, Malakal, Khartum, Aswan, Heliopolis.

The approximate distance of the outward flight will be 5,563 miles, and that of the return flight 11,242 miles. The following will comprise the personnel of the flight :—Group Captain E. M. Murray, D.S.O., M.C., representing A.O.C. Middle East ; Sqdn.-Ldr. H. W. G. J. Penderel, M.C., O.C. ; Flight ; Flt.-Lt. D. D'A. A. Greig, D.F.C., A.F.C. ; Flying Officer C. E. W. N. C. Pelly ; Flying Officer J. B. Knapp ; Sergt. Pilots W. Manning, R. Harding, J. Harrington, and five aircraftmen.

Missing Canadian Airmen Found

AFTER being missing for two months, during which time numerous American and Canadian aircraft took part in searching for them, Capt. E. J. A. Burke (late R.A.F.), Mr. Emil Kading, and Mr. Robert Marten have been located on the Rocky Mountains, Yukon, by Mr. W. L. Wasson from his aeroplane. Capt. Burke was dead, but his companions were still alive but in the last stages of exhaustion. Their aeroplane crashed on October 11 near the Liard River, and, after unsuccessfully hunting for game for several days, they set out on foot towards civilisation, 40 miles away. Capt. Burke died from exposure and hunger on November 20, and it was not until the end of the month that Mr. Wasson located from the air the missing aeroplane, subsequent examination of which disclosed a note saying the airmen had proceeded on foot. Further search led to the observation of smoke from their camp, but Wasson's aeroplane could only land some 12 miles away. Mr. Wasson and his guide, however, proceeded on foot to the camp, and the two survivors were subsequently taken by air to White Horse, Yukon.

Belgian Flight to Congo

Two Belgian airmen, M. Fabry and M. Vanderlinden, left Brussels on December 7 on a flight to the Belgian Congo. They completed their flight on December 15, when they arrived at Leopoldville.

Miss Spooner Home

MISS WINIFRED SPOONER, who with F./O. E. C. T. Edwards made a forced descent in the sea at Belmonte during an attempt to fly to the Cape in record time, arrived back in London on December 20. She had intended to fly home from Paris, but fog prevented this, so she made the journey by boat and train. F./O. Edwards flew back from Paris to Hendon on December 22.

Capt. Mathews Flying Back

CAPT. MATHEWS, who flew from England to Australia last October, will attempt the return flight in his "Puss Moth." He hopes, by flying day and night, to complete the flight from Port Darwin in 9½ days.

Mrs. Victor Bruce in America

THE HON. MRS. VICTOR BRUCE, who recently flew from England to Tokio in her Blackburn "Bluebird," is now in America with her machine. On December 17 she flew from Vancouver to Seattle.

The Westland "Wessex" six-seater cabin monoplane, fitted with three Armstrong Siddeley "Genet Major" engines, which has just completed a 6,000 miles tour of the British Isles.

THE WESTLAND "WESSEX" DEMONSTRATION TOUR

AFTER having been away from her base for nearly 2½ months, the new Westland "Wessex" three-engine, six-seater, cabin monoplane recently returned to Yeovil. In this period she has visited 22 civil aerodromes in the British Isles, serving 60 of the most important cities.

She has flown at least 6,200 air miles and during the whole time, in spite of encountering extremely wintry conditions and bad flying weather, she has arrived at her destination on time to the minute with two exceptions only, when she was held up by fog.

In the course of the tour the Irish Sea was crossed twice, and on the occasion of the journey from Dublin to Liverpool, the long sea crossing was taken and the trip of 143 miles carried out in the fast time of 1 hr. 20 min., in spite of the prevalence of extremely bad weather.

The machine has been demonstrated to over 1,000 of the leading business men and civic authorities of the country ; amongst these have been the Lord Mayors of Norwich, Hull, Leeds, Newcastle, Belfast, Dublin, Manchester, and Nottingham, and the Mayors of Northampton, Wellingboro', Doncaster, Halifax, Huddersfield, South Shields, Dewsbury, Birkenhead, Salford, Kidderminster, and Ipswich.

At the latter place, the Mayor, accompanied by his aged father, Mr. Clouting, flew for the first time, and on landing, the latter pointed out that he could not have bet ter celebrated his 83rd birthday.

Amongst many other people who showed keen interest in the demonstration were Sir Albert Ball, the ex-Lord Mayor of Nottingham ; Col. Shelmerdine, Director of Civil Aviation for India ; Alderman Perlman, the ex-Lord Mayor of Hull ; Col. A. Jerrett, of Messrs. Lewis ; the Chairman and Members of the Belfast Water Board ; Commandant Carroll, Chief of the Irish Free State Air Corps ; the Directors of Northern Air Lines, Manchester, and Directors of National Flying Services ; also a number of the chief constables of the cities where the machine was demonstrated.

Throughout the tour the "Wessex" was acclaimed both by the flying community and the business and public interests as being the first civil aeroplane of a size suitable for use on internal air lines and for private operation, combining the real safety of three engines, low operating costs and limousine luxury.

It is interesting to note that the machine is, of course, of purely British construction. It is fitted with Bendix brakes, which were fully applied in every one of the 250 landings made, and which stood up most satisfactorily to this most stringent test, regardless of the indifferent condition of many of the aerodromes from which the machine has had to operate.

"Ilo" engine oil was used, supplied by W. B. Dick and Co., Ltd., while Messrs. Pratts and British Petroleum supplied the No. 1 80/20 mixture, and it is noteworthy that the "Genet Major" engines ran admirably on this petrol, which costs the same as the ordinary No. 1 petrol used in motor cars. The instruments used are supplied by Messrs. Smiths, Ltd.

Dunlop tyres are fitted on the undercarriage wheels, and a Goodyear low-pressure air wheel takes the place of the orthodox tail skid. The dope and paint throughout on the machine were supplied by Messrs. Titanine, while the Armstrong-Siddeley "Genet Major" engines were fitted with B.T.H. magnetos and the Airscrew Company's propellers.

Rexine interior decoration, Triplex glass, Tecalemit greasers and fescolised exhaust pipes go to make the equipment complete.

The tour was managed on behalf of the Westland Aircraft Works by Capt. H. M. Talbot Lehmann, and the flying was carried out jointly between him and Capt. L. Paget and Mr. F. J. Brunton, the test pilots of the Westland Company.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

December 26, 1930

CONTENTS

METHOD OF STRESSING DIVIDED UNDERCARRIAGES.

By A. E. RUSSELL, B.Sc., A.F.R.Ae.S.

(*Concluded from page* 88.)

The validity of this method depends on the degree of stiffness of the "rigid" structure for transmitting torsion, but allowances may be made for any distortion when estimating the values of ϕ

Example.

Assume an aircraft, all up weight .. 3,650 lb.
Weight of undercarriage .. .. 135 lb.

To estimate stresses in undercarriage when landing with brakes.

The dimensions of the undercarriage are shown in Fig. 8, and the following are the direction cosines of the members.

Positive directions are upward, backwards and inwards from B.

Member	x	y	z	Length	l	m	n
Oleo leg*	− 4·39	+19·12	+59·39	62·55	−0·0701	+0·3055	+0·9492
Radius Rod	+38·83	+10·62	+31·74	51·27	+0·7565	+0·2070	+0·6185
Axle	− 4·43	+32·62	+17·49	37·27	−0·1187	+0·8740	+0·4688
Hinge line	+43·26	−22·00	+14·25	50·58	+0·8551	−0·4349	+0·2816

* Assuming no offset.

Load factor required perpendicular to ground 4·0 and twice maximum braking torque.

Load perpendicular to ground = (3,650 − 135) × 2 = 7,032lb.

Load parallel to the ground = 0·5 × 1,825 × 2 = 1,825 lb.

Braking torque = 1,825 × 14 = 25,550 in. lb.

Assume the axis of the machine to be inclined at 15° to the ground.

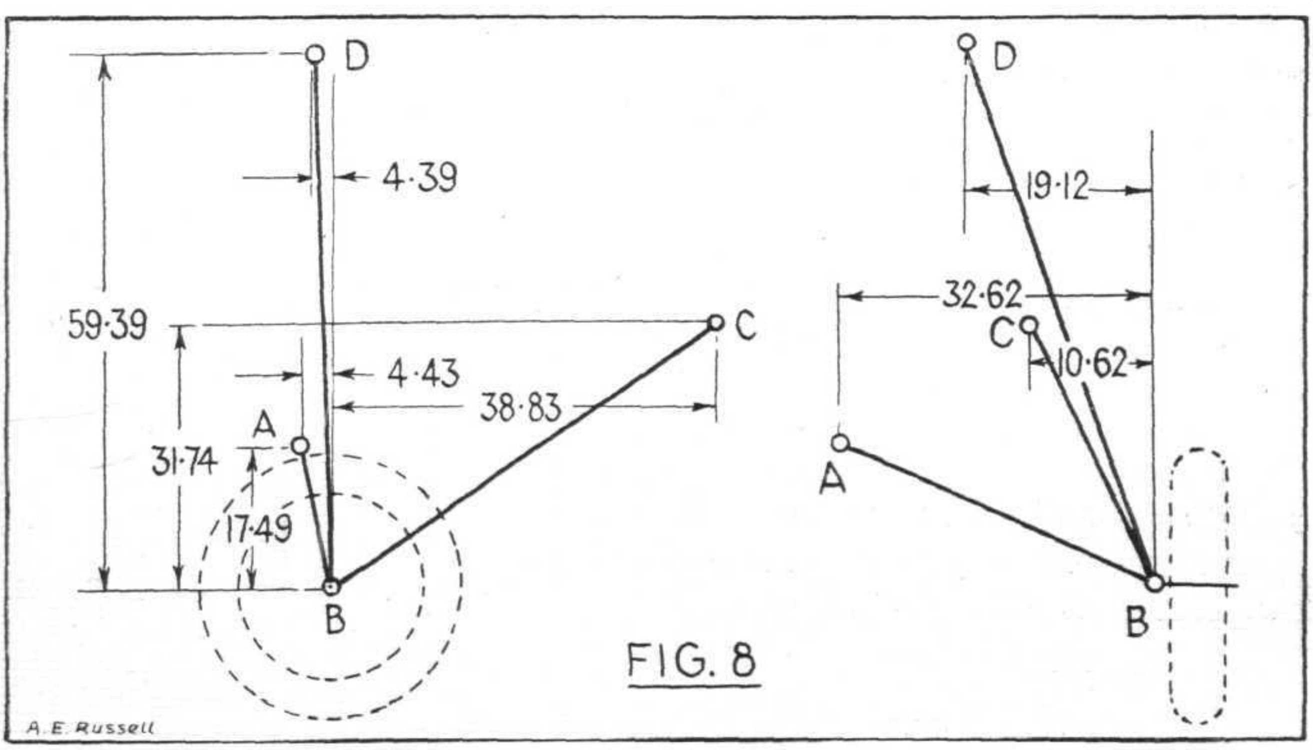


FIG. 8

Resolve these loads into the axes of machine.

Perpendicular to axis $= 7032 \cos 15 + 1825 \sin 15 = \underline{7{,}264}$ lb.

Parallel to axis $= 7{,}032 \sin 15 + 1825 \cos 15 = \underline{-58}$ lb.

and the resultant $R = \sqrt{7264^2 + 58^2} = \underline{7{,}264}$ lb.

The equation is $\dfrac{x}{-0\cdot008} = \dfrac{z}{1\cdot000}$

With a wheel overhang of $5\cdot5$ in.

$Cx = 7264 \times 5\cdot5 = -\underline{39{,}950}$ in lb.

$Cy = \quad = -\underline{25{,}550}$ in lb.

$Cz = -58 \times 5\cdot5 = -\underline{320}$ in lb.

and $C = \sqrt{39{,}950^2 + 25{,}550^2 + 320^2} = \underline{47{,}420}$ in lb.

The equation is $\dfrac{x}{-0\cdot842} = \dfrac{y}{-0\cdot538} = \dfrac{z}{-0\cdot007}$

To find θ, the angle between the hinge line and the axle

$$\cos\theta = (-0\cdot1187 \times 0\cdot8551 + 0\cdot8740z - 0\cdot4349 + 0\cdot4688 \times 0\cdot2816) = \cos^{-1} 0\cdot3496$$

$$= \underline{69\cdot1^\circ} \quad \alpha = 90^\circ - 69\cdot1^\circ = \underline{20\cdot9^\circ}$$

$AE = 0\cdot3496 \times 37\cdot27 = 13\cdot03''$

To find the direction cosines of B E

$AE/AC = 13\cdot03/50\cdot58 = 0\cdot2576$

$$\left.\begin{aligned} x &= 4\cdot43 - 0\cdot2576 \times 43\cdot26 = \underline{+\ 6\cdot71} \\ y &= 32\cdot62 - 0\cdot2576 \times 22\cdot00 = \underline{+\ 26\cdot95} \\ z &= 17\cdot49 + 0\cdot2576 \times 14\cdot25 = \underline{+\ 21\cdot16} \end{aligned}\right\} L_5$$

$$= 34\cdot92 \left\{\begin{aligned} l_5 &= \underline{+\ 0\cdot1921} \\ m_5 &= \underline{+\ 0\cdot7716} \\ n_5 &= \underline{+\ 0\cdot6058} \end{aligned}\right.$$

The external forces may be resolved into the plane ABC.

The cosines of the angles between the force vector and AC and BE

$(-0\cdot008 \times 0\cdot8551 + 1\cdot0 \times 0\cdot2816) = \underline{+\ 0\cdot275}$

$(-0\cdot008 \times 0\cdot1921 + 1\cdot0 \times 0\cdot6058) = \underline{+\ 0\cdot604}$

The cosine of the angle between the force vector and the perpendicular to the plane ABC is

$\sqrt{1 - 0\cdot275^2 - 0\cdot604^2} = \sqrt{0\cdot5596} = \underline{+\ 0\cdot748}$

Hence, the loads at B are

Parallel to $AC = 7{,}264 \times 0\cdot275 = \underline{+\ 2{,}000}$ lb.

Parallel to $BE = 7{,}264 \times 0\cdot604 = \underline{+\ 4{,}390}$ lb.

Perpendicular to $ABC = 7{,}264 \times 0\cdot748 = \underline{+\ 5{,}440}$ lb.

The cosines of the angles between the couple vector and AC and BE are

$(-0\cdot842 \times 0\cdot8551 - 0\cdot538 \times -0\cdot4349 - 0\cdot007 \times 0\cdot2816) = \underline{-\ 0\cdot488}$

$(-0\cdot842 \times 0\cdot1921 - 0\cdot538 \times 0\cdot7716 - 0\cdot007 \times 0\cdot6058) = \underline{-\ 0\cdot581}$

and with the perpendicular

$\sqrt{1 - 0\cdot488^2 - 0\cdot581^2} = \sqrt{0\cdot424} = \underline{-\ 0\cdot651}$

Hence, the couples at B are

Parallel to $AC = 47{,}420 \times 0\cdot488 = \underline{23{,}150}$ in lb.

Parallel to $BE = 47{,}420 \times 0\cdot581 = \underline{27{,}550}$ in lb.

Perpendicular to $ABC = 47{,}420 \times 0\cdot651 = \underline{30{,}980}$ in lb.

Examination of Fittings.—The top axle joint is a universal joint.

A perpendicular to the two pins lies along the line of the axle when the oleo leg is fully compressed.

Its equation is $\dfrac{x}{-0\cdot0970} = \dfrac{y}{0\cdot8606} = \dfrac{z}{0\cdot4997}$

The equation to the plane ABC is

$$x(0\cdot8740 \times 0\cdot2816 - 0\cdot4688 \times -0\cdot4349) - y(-0\cdot1187 \times 0\cdot2816 - 0\cdot4688 \times 0\cdot8551) + z(-0\cdot1187 \times -0\cdot4349 - 0\cdot8740 \times 0\cdot8551) = 0$$

or $0\cdot4500x + 0\cdot4343y - 0\cdot6958z = 0$

$0\cdot4500^2 + 0\cdot4343^2 + 0\cdot6958^2 = 0\cdot8753$

The equation to the normal to the plane is

$$\frac{x}{0\cdot4809} = \frac{y}{0\cdot4641} = \frac{z}{-0\cdot7436}$$

The angle between the axis of the couple and the axle is $\cos^{-1}(0\cdot1187 \times 0\cdot0970 + 0\cdot8740 \times 0\cdot8606 + 0\cdot4688 \times 0\cdot4997) = \cos^{-1} \underline{0\cdot9982}$

and with the normal to the plane

$$\cos^{-1}(-0\cdot0970 \times 0\cdot4809 + 0\cdot8606 \times 0\cdot4641 + 0\cdot4997 \times -0\cdot7436) = \cos^{-1} \underline{-0\cdot0188}.$$

The angle with the perpendicular on the axle in the plane ABC is

$\sqrt{1 - 0\cdot9982^2 - 0\cdot0188^2} = \sqrt{0\cdot00324} = \cos_{-1} \underline{0\cdot0569}$

The torque transmitted through the joint is $T_A/0\cdot9982 = 1\cdot002T_A$

The bending moment vector along the normal to the plane is $0\cdot0188\ T_A$ and along the perpendicular on the axle $0\cdot0569 T_A$ *i.e.*, $M_A{}^1 = 0\cdot0569\ T_A$.

These two bending moments are small and could be ignored but they will be included to illustrate the method. The top radius rod joint is a ball joint $\therefore T_R = M'_R = 0$. The fitting at B has one pin perpendicular to the plane ABC so that a bending moment in the radius rod may induce torsion or bend in the axle. The axle must take the entire couple about the normal to the plane.

To find the components of the oleo leg in the plane ABC.

1. *Assuming No Offset*

Parallel to AC Po $(-0\cdot0701 \times 0\cdot8551 + 0\cdot3055 \times -0\cdot4349 + 0\cdot9492 \times 0\cdot2816) = +\ 0\cdot0744$ Po.

Parallel to BE Po $(-0\cdot0701 \times 0\cdot1921 + 0\cdot3055 \times 0\cdot7716 + 0\cdot9492 \times 0\cdot6058) = +\ 0\cdot7964$ Po.

Perp. to plane $\sqrt{1 - 0\cdot0744^2 - 0\cdot7964^2} = \sqrt{0\cdot36020} = +\ 0\cdot6002$ Po.

2. *Correcting for Offset*

The lower oleo pin is 2, $\frac{5}{16}$ in. from and in the plane ABC and perpendicular to the axle, and 2, $\frac{1}{16}$ in. above the plane

$$\left.\begin{aligned} Po\,(x) &= 0\cdot0704 \times 62\cdot55 - 2\cdot312 \cos 20\cdot9 = +\ 2\cdot49 \\ Po\,(y) &= = +\ 49\cdot82 \\ Po\,(z) &= 0\cdot6002 \times 62\cdot55 - 2\cdot06 = +\ 35\cdot49 \end{aligned}\right\} L'_1 = 61\cdot24$$

and the true components along x^1, y^1, z^1 (*i.e.*, axes in plane ABC) are $0\cdot0406$, $0\cdot8134$, $0\cdot5794$.

The offset oleo couple is Po $(0\cdot5794 \times 2\cdot16 - 0\cdot0406 \times 2\cdot06) = 1\cdot17$ Po.

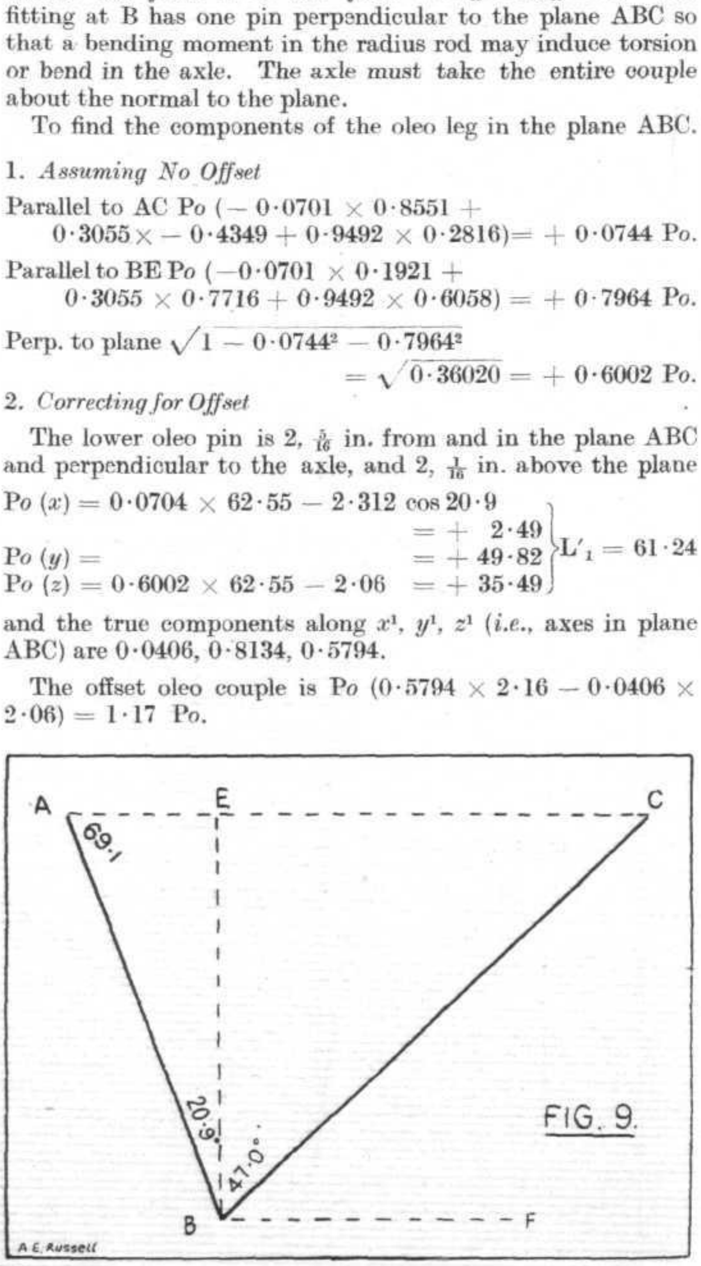


FIG. 9.

Equations to be Used

$\sin\theta_R = \sin\theta_A \cos 67\cdot9 - \sin\phi_A \sin 67\cdot9$ ....(1)

$M_A \cos 20\cdot9 - T_A \sin 20\cdot9 + M_R \cos 47^\circ = 23{,}150$ ....(2)

$M_A \sin 20\cdot9 + T_A \cos 20\cdot9 - M_R \sin 47 + 1\cdot17\ Po = 27{,}550$ (3)

$$0\cdot5794\ Po = 5{,}440 + \frac{M_A - M'_A}{37\cdot27} + \frac{M_R}{51\cdot27} \quad \text{..............(4)}$$

$\sin\theta_R$, $\sin\theta_A$, and $\sin\phi_A$ must be determined in terms of the bending moments and torsions.

Before $\sin\theta_A$ and $\sin\theta_R$ may be estimated, approximate end loads in the members must be found.

Assume $T_A = 0$

From (2) $\quad 0\cdot934\ M_A + 0\cdot682\ M_R = 23{,}150$

$\quad M_A = 24{,}800 - 0\cdot730\ M_R$.

Subst. (4) $\quad 0\cdot5794\ Po = 5{,}440 + 665 - 0\cdot0196\ M + 0\cdot0195\ M$

$= 6{,}105$

$Po = 10{,}540$ approximately

applied loads at B are

Along BF $= +\ 2{,}000 - 430 = +\ \underline{1{,}570}$

Along BE $= -\ 4{,}390 + 8{,}570 = +\ \underline{4{,}180}$

By the triangle of forces $Po = 4{,}400$ T and $P = 0$.

For end loads due to the couple about the z axis, ignore $0\cdot0188\ T_A$. The net couple is

$30{,}980 - 10{,}540 \times 2\cdot312 \cos 20\cdot9 = \underline{8{,}180 \text{ in lb.}}$

This must be taken entirely by the axle.

The shear in the axle is $8{,}180/37\cdot27 = 220$ lb., and must be balanced at B by end loads.

By a simple triangle of forces $Po = 90$ T and $P = 230$ C.

Net loads are $Po = 4{,}400 + 90 = \underline{4{,}490 \text{ T.}}$

$P_R = 220 = \underline{220 \text{ C.}}$

To estimate dy/dx for the axle ($2\frac{1}{8}$ in. $\times$ 16 SWG $\times$ T·2).

$$\frac{P}{EI} = \frac{4{,}490}{30 \times 10^6 \times 0\cdot2203} = 0\cdot000679 \quad \therefore\ \mu = 0\cdot0261$$

$$\mu L = 0\cdot972$$

$$\frac{dy}{dx} = \frac{0\cdot0261 \times 0\cdot056\ 9T_A}{4{,}490 \times 1\cdot125} - \frac{0\cdot0261\ M_A \times 1\cdot50}{4{,}490 \times 1\cdot125} + \frac{M_A - 0\cdot0569\ T_A}{37\cdot27 \times 4{,}490}$$

$$= 0\cdot294\ T_A \times 10^{-6} - 7\cdot75\ M_A \times 10^{-6} + 5\cdot97\ M_A \times 10^{-6} - 0\cdot340\ T_A \times 10^{-6}$$

$$= -\ 1\cdot78\ M_A \times 10^{-6} - 0\cdot046\ T_A \times 10^{-6}$$

To estimate dy/dx for the radius rod ($2''$ o/d $\times$ 17 SWG).

Ignoring the end load

$$\frac{dy}{dx} = -\ \frac{51\cdot27 \times 2\ M_R}{6 \times 30 \times 10^6 \times 0\cdot1616} = -\ 3\cdot52\ M_R \times 10^{-6}$$

To estimate sin ϕ_A *for the axle.*

$$\phi_A \text{ radians} = \frac{1\cdot25 \times T \times 37\cdot27}{30 \times 10^6 \times 0\cdot2691} = 5\cdot76\ T_A \times 10^{-6}$$

Re-writing the equations and substituting the values of $\sin\theta_R$, $\sin\theta_A$, and $\sin\phi_A$,

$0\cdot670\ M_A - 5\cdot31\ T_A - 3\cdot52\ M_R = 0$ (1)

$0\cdot934\ M_A - 0\cdot357\ T_A + 0\cdot682\ M_R = 23{,}150$ (2)

$0\cdot357\ M_A + 0\cdot934\ T_A - 0\cdot731\ M_R + 1\cdot17\ Po = 27{,}550$ (3)

$0\cdot268\ M_A - 0\cdot015\ T_A + 0\cdot195\ M_R - 5\cdot79\ Po = 54{,}400$ (4)

From (1) $M_R = 0\cdot190\ M_A - 1\cdot51\ T_A$

From (2) $1\cdot064\ M_A - 1\cdot39\ T_A = 23{,}150$

$T_A = -\ 16{,}650 + 0\cdot765\ M_A$

$M_R = +\ 25{,}170 - 0\cdot966\ M_A$

Substituting in (3) and (4)

$1\cdot778\ M_A + 1\cdot17\ Po = 61{,}500$

$0\cdot069\ M_A - 5\cdot79\ Po = 59{,}550$

$0\cdot069\ M_A + 0\cdot04\ Po = 2{,}390$

$-\ 5\cdot83\ Po = -\ 61{,}940$

$Po = 10{,}620$

$M_A = 27{,}600$ *in lb.* $\quad T_A = 4{,}490$ *in lb.*

$M_R = -\ 1{,}530$ *in lb.*

The maximum bending moment in the axle at B will be the resultant of the bending moment just found and the bending moment due to $C'z$.

i.e., M_A max. $= \sqrt{27{,}600^2 + 8{,}180^2}$

$= 28{,}780$ *in lb.*

The position of maximum stress is 6″ inside B. To find the bending moment at this point

$$\text{Vector perpendicular to plane} = 8{,}180 \times \frac{31\cdot27}{37\cdot27} + 4{,}490 \times 0\cdot0188 \times \frac{6}{37\cdot27}$$

$= \underline{6{,}870 \text{ in lb.}}$

$$\text{Vector in plane} = 28{,}780 \times \frac{31\cdot27}{37\cdot27} + 4{,}490 \times 0\cdot0569 \times \frac{6}{37\cdot27}$$

$= \underline{24{,}170 \text{ in lb.}}$

Resultant B.M. $= \sqrt{24{,}170^2 + 6{,}870^2}$

$= \underline{25{,}130 \text{ in lb.}}$

The equivalent B.M. $= 1/2\ (25{,}130 + \sqrt{25{,}130^2 + 4{,}490^2})$

$= \underline{25{,}520 \text{ in lb.}}$

$$\text{Stress} = \frac{25{,}520}{0\cdot2073 \times 2{,}240} + \frac{4{,}490}{0\cdot414 \times 2{,}240}$$

$= \underline{59\cdot8 \text{ tons/sq. in.}}$

Note.—The vertical lines in margin indicate work which applies to all cases of stressing, *i.e.*, it is done once only for each undercarriage.

TECHNICAL FEATURES OF THE AIR MAIL.

By FRANK RADCLIFFE, B.Sc., A.M.I.A.E., A.R.Ae.S.

(*Continued from p.* 84.)

Visitors to the Paris Aero Show, and readers of FLIGHT'S *report on the Show, will doubtless note the similarity between the retractable undercarriage used on Mr. Radcliffe's design this month and that fitted on the Bleriot* 111. *Lest there should be any tendency to accuse Mr. Radcliffe of "copying," we think it is only fair to state that the design shown in Fig. V was in our hands before Mr. Radcliffe could possibly have known of the Bleriot machine, so that if there are points of resemblance, they are due to two designers thinking alike, and not to wilful copying on the part of Mr. Radcliffe. In any case, we do not know what are the details of Mr. Radcliffe's retractable undercarriage design, and it will most probably be found that they are very different from those of the Bleriot monoplane retractable undercarriage.*

While on the subject of the retractable undercarriage, it is of interest to note that Mr. Radcliffe comes to the conclusion that by fitting it, and slightly reducing the wing area, an increase in top speed of no less than 22 *miles per hour is achieved, which corresponds to a reduction in petrol at cruising speed of* $23\frac{1}{2}$ *gallons, or put in another way, an increase in range from* 750 *miles to* 860 *miles. Or, if the saving in fuel were used to carry extra pay load, this would be increased from* 1,000 *lb. to* 1,180*lb.*

V.—Design for a Mail-plane.

It was stated in the last article that a cruising speed of 150 m.p.h. was possible with an orthodox type of aeroplane

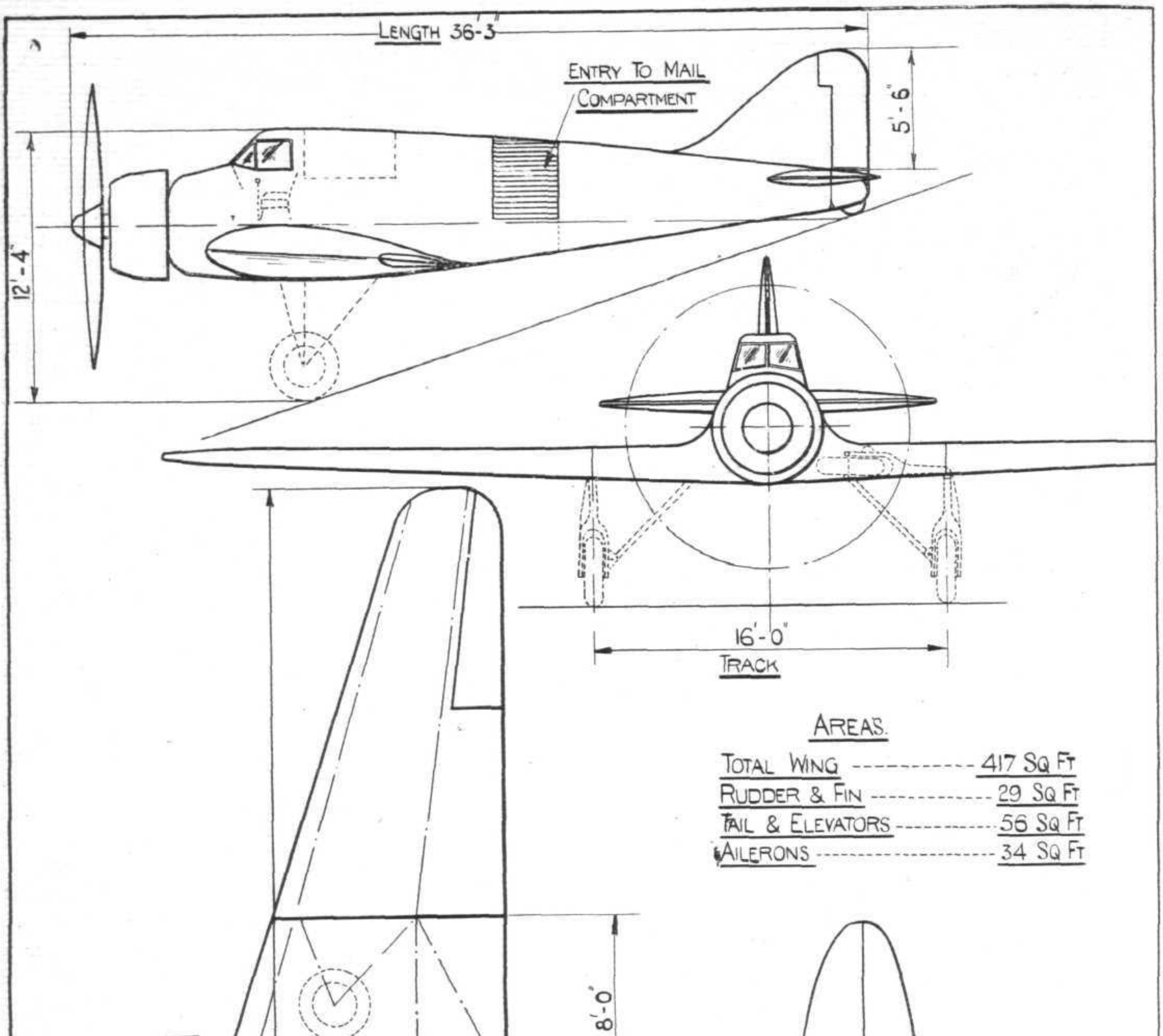


Fig. V. : Modified Design for a Mailplane. By Frank Radcliffe. Note retractable undercarriage.

at the expense of horsepower. The writer felt it might be of interest to readers of this series of articles if he developed a little more fully the monoplane illustrated in Fig. III of last month's AIRCRAFT ENGINEER. The investigations made led to the modified design which is now depicted in Fig. V.

There are certain criticisms that can be levelled at the scheme illustrated, but the writer feels that this is a feature common to all innovations. Directly one tries to get out of the rut of commonplace and accepted design one is open to criticism, and yet, it is often only by breaking away from the purely conventional that progress is possible.

The general arrangement drawings indicate where the search for cleanness in outline has led the writer. The aircraft is a low wing monoplane with the wings reduced in area and tapering to the tips and having a sufficiently large chord at the root to enable one to fold the undercarriage into the wings themselves.

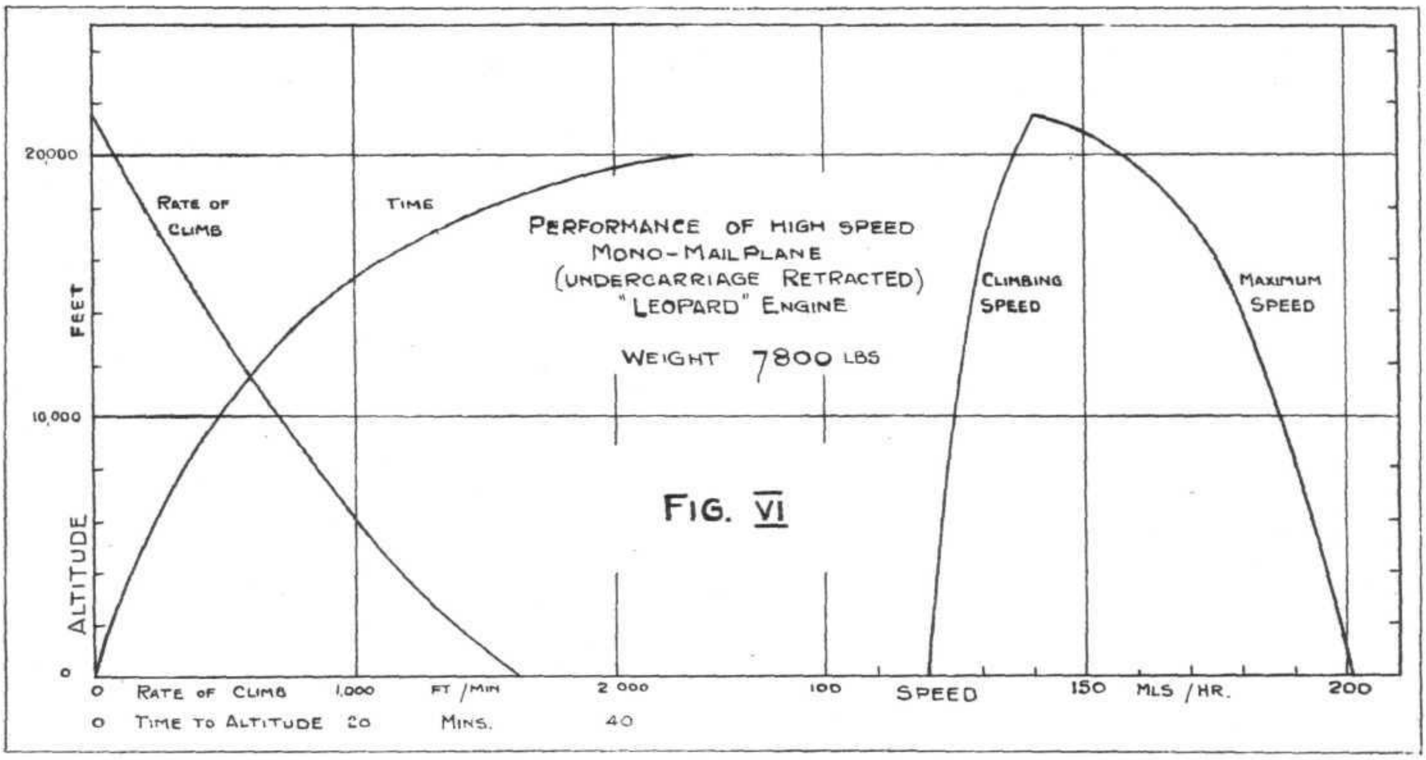


FIG. VI

The advantages are quite considerable :—

(1) A minimum of parasitic drag can be guaranteed, for it is a well-known fact that the undercarriage and its interference on the local airflow is responsible for a considerable proportion of the drag of an aircraft of this size (approximately 20 per cent. of the parasitic drag).

(2) It is still possible to keep the petrol system of the simple gravity-feed type if the tanks are located just aft of the cabin as indicated.

(3) By cutting down the wing area from 585 sq. ft. to 417 sq. ft., the landing speed has been increased to 70 m.p.h. it is true, but the overall dimensions of the aircraft can then be considerably reduced, and further economies in weight and drag will thus be assured.

(4) The top speed has been increased by 22 m.p.h. and consequently the aircraft would be better able to maintain its scheduled flying time, whatever the weather conditions were, due to its increased reserve of horse power.

(5) The petrol consumption at 150 m.p.h. has been reduced by 23½ gallons on the 750 miles, or, stated in other ways, the aircraft has had its range increased from 750 to 860 miles, or the mail load could be increased from 1,000 lbs. to 1,180 lbs. with the range maintained at 750 miles.

It might be well to look at some of the disadvantages that can be levelled at this design.

(1) This aircraft will be more costly to construct than the former, due to the added complications caused by the pronounced tapering of the wings and the retracting mechanism for the undercarriage. In reply to these objections, the writer would like to suggest that the benefits derived must be weighed against the additional cost involved and the correct judgment then delivered. Thus, it seems necessary that full regard should be paid to the proportional cost of these requirements to the total aircraft ; and to the gain in performance yielded by the suggested modifications. (Reference to Appendices I and II will be useful in assessing the real gain.)

(2) All the gain in cleanness will not actually be realisable due to the gaps in the undersurface of the wings at the parts where the wheels sink into the wings. This is quite true, but it is believed that the loss can be made very small if use is made of small guide planes situated at the leading edges of the wing roots which would serve in much the same way as a Townend Ring in helping to maintain continuity of air flow.

(3) The position of the petrol tank is such as to increase the chance of fire risk to the crew and the valuable air mail cargo in the event of a crash. Whilst this argument is certainly correct, it does not follow, absolutely, that any alternative position would lead to guaranteed immunity from fire risk. The writer feels that, on the whole, the best position for the petrol in this design would be in the wing or low down in the body so as to allow of tanks being fitted which could easily be dropped. In addition, the aircraft would then have more lateral stability if the centre of gravity of the whole aircraft were lowered in this way.

(4) The present type would probably handicap the assistant pilot in his discharge of duties ; preventing him from dropping or picking up mails with the same ease as the original design permitted.

(5) There are certain dangers present, due to time interval necessary to lower the undercarriage into position in the event of a forced landing. A partial solution to this would be afforded if flying took place at certain fixed altitudes above the ground level, and from the fact that an assistant pilot is postulated as necessary for this class of aircraft.

Summing up, the position seems to be that :—A mail-plane could be produced that would be fast and relatively economical for use in mail service, but that such an aircraft would have certain operational disadvantages which would have to be weighed against what one might group as aerodynamic and economic advantages. The crew's work would be increased, and the risks from forced landings would be aggravated. The writer's own view in the matter is, that to begin air-mail services with added complications would not be wise, and that a better way would be to commence operations with an orthodox type of aircraft such as was illustrated last month. When experience had been gained from experimental testing of retractable undercarriages then,

and not before, would be the opportune time to introduce added complications.

A supercharged engine would certainly give advantages at altitude, but at the expense of the run to take off. The daily press has recently illustrated a form of aircraft catapult that has been installed for experimental work at the R.A.E., Farnborough. Such a piece of apparatus would prove of use in making the smaller aerodromes adequate for the requirements of high performance mail-planes.

Calculations were made on the assumption that a constant acceleration of 3 g. was obtainable throughout the operating stroke of a catapult. The aircraft considered was the one illustrated in Fig. V, and the length of stroke required was found to be approximately 50 ft., whilst the time was 1·0 sec. It is, of course, appreciated that the installation of catapults on all terminal aerodromes would be a serious charge on the operating company's resources, and consequently could not be contemplated for the immediate future.

APPENDIX II.

Sundry Data

All up weight of aircraft	= 7,800 lbs.
B.H.P. normal at 1,700 r.p.m.	= 813
Area of wings (55 ft. × 9·5 ft.) = S	= 417 sq. ft.
Aspect ratio	= 7·32
Distance from C.G. to Sternpost (l)	= 23·5 ft.
Area of fin and rudder S_R	= 29 sq. ft.
Area of tail and elevators S_T	= 55·5 sq. ft.

$$\text{Rudder volume} = \frac{S_R \times l}{S \times s} = \frac{29 \times 23 \cdot 5}{27 \cdot 5 \times 417} = 0 \cdot 0595$$

$$\text{Tail volume} = \frac{S_T \times l}{S \times c} = \frac{55 \cdot 5 \times 23 \cdot 5}{9 \cdot 5 \times 417} = 0 \cdot 33$$

For the *landing speed*, it is reasonable to assume again, that K_L for the whole aircraft = 0·75. (The cushioning effect of the wings near the ground should be quite pronounced.)

∴ landing speed, full tanks	= 70 m.p.h.
and landing speed, empty tanks	= 63 m.p.h.

Performance (see Fig. VI)

Altitude Feet.	Maximum speed. m.p.h.	Maximum rate of climb. ft. per min.	Time to altitude. Mins.
G.L.	201	1,625	—
5,000	194	1,090	3·8
10,000	187·5	710	9·5
15,000	178	380	19·1
20,000	157	80	45·9

Service ceiling = 19,600 ft.

Run to get off (in still air) and climb to 66 ft. = 848 yards

Time = 23·8 secs.

Landing run (in still air) with wheel brakes ($\mu = 0 \cdot 25$) and air brakes capable of increasing the total drag by 20 per cent. = 285 yds.

Time = 15·2 secs.

Cruising Particulars

	At 140 m.p.h.	At 150 m.p.h.	At 160 m.p.h.
Miles per gallon ..	4·92	4·68	4·38
Petrol consumed for a range of 750 miles	152·5 galls.	160·5 galls.	171 galls.
R.P.M.	1,436	1,524	1,612
Time for 750 miles	5·35 hours	5·0 hours	4·68 hours

Mr. Radcliffe will continue his series of articles with an instalment on " Progress Abroad."

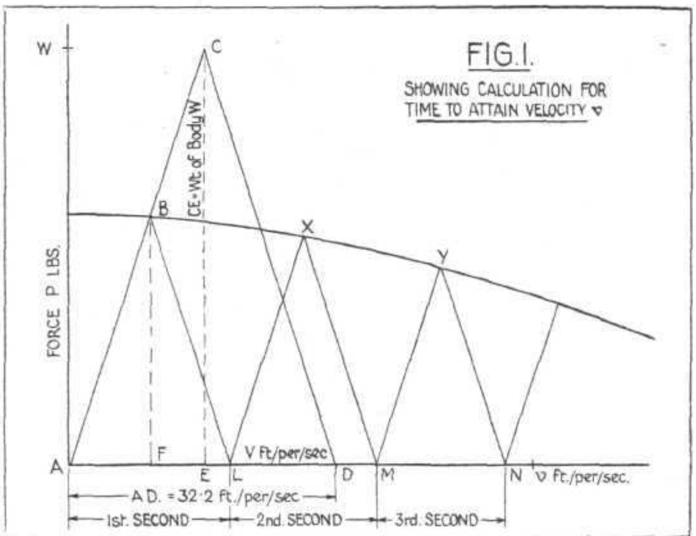
SEAPLANE TAKE-OFF CALCULATIONS

By H. PARKINSON, A.R.Ae.S.

In examining projected designs for aircraft, the calculations, are usually computed from existing designs about which the characteristics are known, and in the case of seaplanes typical curves of water resistance are conveniently plotted on a percentage basis of weight/resistance and take-off time.

Assumptions for air- and water-resistance are therefore available, and from this information we are able to plot the basic curves for assessing possibilities (Fig. 2).

The writer admits that the accuracy of the required data for laying down the basic curves is dependent upon research and experience with previous designs, and that in the absence of one or both of the foregoing it will be necessary to make empirical assumptions. This article, however, is not intended to offer opinions in this respect, but to show certain calculations which are involved.



The following method for calculating run and take-off time was mentioned recently by Herr Hermann* and it is explained here in detail, together with a comparative method which gives some indication of the amount of error to be expected.

Explanation.—Fig. 1 shows the velocity of a moving body due to varying forces in the direction of motion. From the figure we wish to find graphically the time taken to attain a velocity of v.fps.

On the velocity scale we set out the acceleration due to gravity (AD = 32·2 fps.) and vertically the weight of the body (CE = W). Connection of these points gives an isosceles triangle, from which we draw a series of parallel lines intersecting the curve at B.X.Y. and the velocity scale at L.M.N.

Triangles ACD and ABL are similar.

$$i.e., \quad \frac{AL}{BF} = \frac{AD}{CE} \therefore AL = \frac{AD \cdot BF}{CE}$$

To force scale, CE = W. BF = P.

$$\text{To velocity scale AD} = g. \quad \therefore AL = \frac{g \cdot P}{W}.$$

AL represents the velocity increase of W in one second under the action of a force equal to P lbs. weight. Due to similarity the base of each triangle indicates the gain in velocity during successive seconds, and the number of intersections with the velocity scale is equal to the number of seconds taken in attaining a velocity of v.fps. In this example the time taken is a little over 3 seconds.

Application.

Plotting of Figure 2.—(*a*) The take-off speed is calculated. (*b*) From the typical water resistance curve, mentioned above,

* Berichte und Abhandlungen der Wissenschaftlichen Gesellschaft fur Luftfahrt, 1926.

it is now possible to plot the water resistance curve of the design which we are considering (indicated by R). (*c*) Airscrew thrust for various speeds over taxying range calculated and plotted (indicated by T). (*d*) Air resistance for speeds indicated in (*c*) calculated, and curve *t* plotted (see notes on Figure 2).

Calculation of Take-off Time.—Application of the foregoing method to characteristics on Figure 2 show that we may expect her to take-off in 12 seconds.

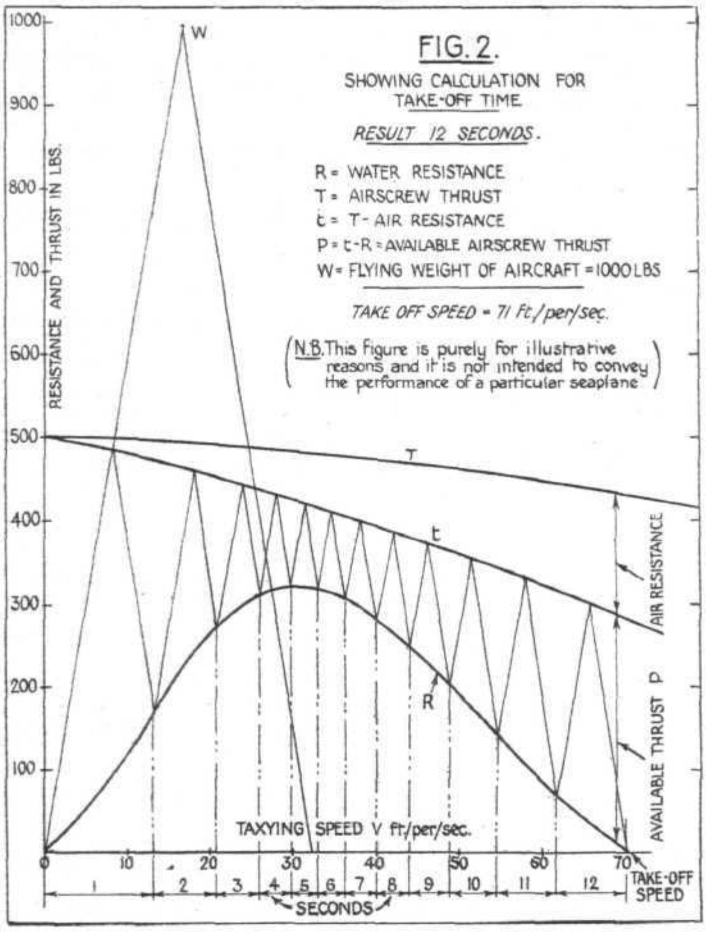


FIG. 2.

Take-off Run :—The length of run for take-off is given by the sum of the mean speeds for each second from start to take-off.

Table A. (**From Figure 2.**)

No. of seconds from start.	V at end of each second.	Mean V = V1.	Distance moved = V1·t. (t = 1 sec.).
0	0		
1	13	6·5	6·5
2	21	17·0	17·0
3	26	23·5	23·5
4	30	28·0	28·0
5	33	31·5	31·5
6	36	34·5	34·5
7	40	38·0	38·0
8	44	42·0	42·0
9	49	46·5	46·5
10	55	52·0	52·0
11	62	58·5	58·5
12	70	66·0	66·0
			Total 444 feet.

Length of run to take-off = 444 feet.

Comparative Method.

Take-off time :—The laws of motion provide,
$V = at$ and $a = \frac{\text{force}}{\text{mass}}$ $\therefore$ time $= \frac{\text{mass}}{\text{force}} \times$ velocity, and $\frac{\text{mass}}{\text{force}} = \frac{1}{a}$. By plotting $\frac{1}{a}$ against v over a given range, we obtain a curve the area under which is indicative of the time taken to attain any given velocity.

From Fig. 2, the mass of the aircraft $= \frac{W}{g} = \frac{1{,}000}{32 \cdot 2} = 31 \cdot 1$, and $\frac{1}{a} = \frac{31 \cdot 1}{P}$.

Table B gives the calculation of $\frac{1}{a}$ for various velocities v over the taxying range.

Table B. (**From Fig. 2.**)

Velocity v	Available airscrew thrust P.	$\frac{31 \cdot 1}{P}$
1	485	0·064
3	463	0·067
5	440	0·071
10	355	0·088
15	263	0·118
20	180	0·173
25	130	0·239
30	100	0·311
35	98	0·317
40	110	0·282
45	135	0·230
50	168	0·185
55	200	0·155
60	234	0·133
65	260	0·120
70	275	0·113

These values are plotted on Fig. 3, and the result shows a take-off time of 12·65 sec.

Take-off run.—On Fig. 3, the speed/time diagram for take-off run is plotted directly from the diagram for take-off

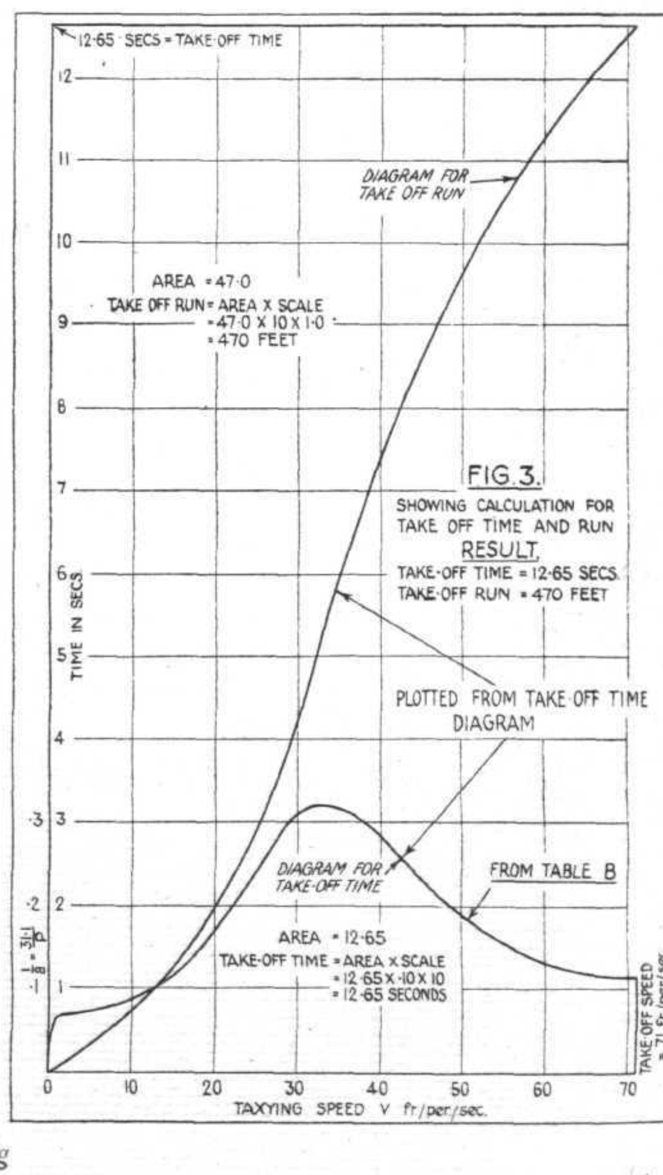


FIG. 3.

time, *i.e.*, the time taken to attain a velocity of, say, 10 fps, is given directly by the area under the curve between the origin and 10 fps.

From the diagram we see that a take-off run of 470 ft. may be expected.

Comparing the results we have :—

By first method—

Take-off time = 12 sec.

Take-off run = 444 ft.

By second method—

Take-off time = 12·65 sec.

Take-off run = 470 ft.

Calculations, as will be understood, are made on the assumption of smooth seaway and no wind.

TECHNICAL LITERATURE

SUMMARIES OF AMERICAN N.A.C.A. REPORTS

Two Types of Report are issued by the American National Advisory Committee for Aeronautics :—one in mimeographed form, is known as *Technical Notes*, and is not available to the general public. The other is known as *Technical Reports*, and copies can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. To the prices given below should, of course, be added a certain amount for postage. Below we give brief summaries of some recent *Technical Reports*.

REPORT NO. 341: THE DESIGN AND DEVELOPMENT OF AN AUTOMATIC INJECTION VALVE WITH AN ANNULAR ORIFICE OF VARYING AREA. By W. F. Joachim, C. W. Hicks and H. H. Foster. Price 10 cents.

The injection valve described in this report was designed and developed at the Langley Memorial Aeronautical Laboratory of the National Advisory Committee for Aeronautics in connection with a general research on aircraft oil engines. The purpose of this investigation was to provide an automatic injection valve of simple construction, which would produce a finely atomised oil spray of broad cone angle and would fulfil the requirements of fuel injection in aircraft oil engines. The injection valve designed has only six parts, *i.e.*, two concentric nozzle tubes flared at one end, two body parts, and two nuts. The nozzle tubes are provided with seats at the flared ends to form an annular orifice which automatically varies in area with the injection pressure. Adjustment of the nuts determines the valve-opening pressure. The fuel passage to the orifice is provided by the clearance space between the nozzle tubes. When sufficient oil pressure is developed by the fuel pump, the flared ends of the nozzle tubes move apart slightly, and the oil passes through the annular orifice, producing a broad conical spray. The nozzle tubes are so constructed as to cause the cylinder gases to heat them approximately 500° F., which preheats the oil and tends to reduce the ignition lag.

The results of tests made with the N.A.C.A. Spray Photography Equipment on this injection valve indicate the effect of several factors on spray penetration. For a duration of injection of 0·003 second, and a valve-opening pressure of 2,500 lb. per square inch, a change of injection pressure from 6,000 to 10,000 lb. per square inch increased the penetration 25 per cent. For a constant speed and fuel quantity per cycle a change of valve-opening pressure from 2,000 to 5,000 lb. per square inch, which caused a corresponding change in maximum injection pressure from 6,700 to 10,500 lb. per square inch, increased the penetration 5 per cent. A change of spray-chamber air density corresponding to a change of compression ratio of from 11·2 to 15·3 decreased the spray penetration 8 per cent. Curves are presented showing these effects, together with the effect of engine-operating temperature on the valve-opening pressure.

Analysis and engine tests indicate that the fuel spray from this type of injection valve has characteristics which reduce the time lag of auto-ignition and promote efficient combustion in high-speed oil engines.

REPORT NO. 342: EFFECT OF TURBULENCE IN WIND TUNNEL MEASUREMENTS. By H. L. Dryden and A. M. Kuethe. Price 10 cents.

This investigation was carried out at the Bureau of Standards at the request of and with the financial assistance of the National Advisory Committee for Aeronautics. The paper gives some quantitative measurements of wind tunnel turbulence, and its effect on the air resistance of spheres and airship models, measurements made possible by the hot wire anemometer and associated apparatus developed at the Bureau of Standards. The apparatus in its original form was described in Technical Report No. 320 and some modifications are presented in an appendix to the present paper.

One important result of the present work is a curve by means of which measurements of the air resistance of spheres can be interpreted to give the turbulence quantitatively. Another is the definite proof that the discrepancies in the results on the N.P.L. standard airship models are due mainly to differences in the turbulence of the wind tunnels in which the tests were made.

An attempt is made to interpret the observed results in terms of the boundary layer theory and for this purpose a brief account is given of the physical bases of this theory and of conceptions that have been obtained by analogy with the laws of flow in pipes.

REPORT NO. 343: EFFECT OF VARIATION OF CHORD AND SPAN OF AILERONS ON ROLLING AND YAWING MOMENTS AT SEVERAL ANGLES OF PITCH. By R. H. Heald, D. H. Strother, and B. H. Monish. Price 15 cents.

This report presents the results of an extension to higher angles of attack of the investigation described in Reference 1, of the rolling and yawing moments due to ailerons of various chords and spans on two airfoils having the Clark Y and U.S.A. 27 wing sections.

The measurements were made at various angles of pitch, but at zero angle of roll and yaw, the wing chord being set at an angle of + 4 degrees to the fuselage axis. In the case of the Clark Y airfoil the measurements have been extended to a pitch angle of 40 degrees, using ailerons of span equal to 67 per cent. of the wing semispan and chord equal to 20 and 30 per cent. of the wing chord. It is planned later to extend the investigation to hinge moments of the ailerons for the conditions covered in the rolling and yawing moments tests.

The work was conducted in the 10-ft. wind tunnel of the Bureau of Standards on wing models of 60-in. span and 10-in. chord.

REPORT NO. 346: WATER PRESSURE DISTRIBUTION ON A FLYING BOAT HULL. By F. L. Thompson. Price 10 cents.

This investigation was conducted by the N.A.C.A. at the request of the Bureau of Aeronautics, Navy Department. This is the third in a series of investigations of the water pressure on seaplane floats and hulls, and completes the present program. It consisted of determining the water pressures and accelerations on a Curtiss H-16 flying boat during landing and taxying manœuvres in smooth and rough water.

The results show that the greatest water pressures occur near the keel at the main step, where the maximum pressure is approximately 15 lb. per sq. in. From this point maximum pressures decrease in magnitude toward the bow and chine. Pressures of approximately 11 lb. per sq. in. were experienced at the keel slightly forward of the middle of the forebody when taking off in rough water. The area of the forebody subjected to considerable pressure is roughly a triangle having its base at the step and its apex on the keel at the load water line forward. On the bottom between steps, a maximum pressure of 8 lb. per sq. in. is nearly uniform. A vertical acceleration of 4·7 g. is the greatest value encountered in landings, and is considerably greater than any other value recorded. It was found that 3 g. is approximately the maximum to be expected in take-offs in rough water, and that this value was exceeded during only a few landings. A longitudinal acceleration of 0·9 g. was once attained in a landing in rough water, and 0·7 g. is not unusual for take-offs in rough water. The maximum lateral acceleration attained in cross-wind landing is approximately 0·5 g. The results show that the landing loads were usually borne by an area near the main step, and that rough water may cause large loads to be applied near the middle of the forebody.

REPORT NO. 353: AIRFOIL PRESSURE DISTRIBUTION INVESTIGATION IN THE VARIABLE DENSITY WIND TUNNEL. By Eastman N. Jacobs, John Stack, and Robert M. Pinkerton. Price 10 cents.

With a view to extending the knowledge of the aerodynamics of lifting surfaces, the distribution of pressure over one section each of six airfoils has been measured in the Variable Density Wind Tunnel of the Nationa Advisory Committee for Aeronautics. The following airfoils were investigated :—N.A.C.A. 85-J, N.A.C.A. 84-J, N.A.C.A. 84, N.A.C.A.M.-6, Clark Y, and R.A.F. 30.

Pressure distribution diagrams, as well as the integrated characteristics of the airfoils, are given for both a high and a low dynamic scale Reynolds' Number for comparison with flight and other wind-tunnel tests, respectively. It is concluded that the scale effect is very important only at angles of attack near the burble. The distribution of pressure over an airfoil having a Joukowski section is compared with the theoretically derived distribution. A further study of the distribution of pressure over all of the airfoils resulted in the development of an approximate method of predicting the pressure distribution along the chord of any normal airfoil for all attitudes within the working range if the distribution at one attitude is known.

NEXT MONTH'S ISSUE

The present issue of the AIRCRAFT ENGINEER *concludes five years of publication, and the Editor wishes to take this opportunity to thank all those contributors who have, during that period, enabled us to keep up this monthly Technical Supplement to* FLIGHT. *He would also express his grateful thanks to the numerous readers, at home and abroad, who have written to express appreciation (and, in a few instances, the reverse) of the material published in the* AIRCRAFT ENGINEER. *It is extremely gratifying to find our little effort followed so closely, and the knowledge that the* AIRCRAFT ENGINEER *is widely read and appreciated encourages us to continue its publication in* 1931.

The January, 1931, *issue will contain, in addition to another instalment by Mr. Radcliffe, two contributions dealing with the Paris Aero Show. One of these, by Mr. H. J. Pollard, will deal with the progress of all-metal construction as indicated by the machines exhibited at Paris, while the other will relate to developments in aero engines, as revealed by an inspection by Capt. A. E. Swan of the engines shown in the Grand Palais. Capt. Swan is, as many of our readers will know, one of the principal technical officers of the Royal Aircraft Establishment at Farnborough, and is thus not only well qualified to write on the subject of engines, but may be assumed to be perfectly impartial and unbiased.*

PRIVATE FLYING AND CLUB NEWS

LONDON Aeroplane Club will be holding their annual dinner and dance at the Park Lane Hotel, Piccadilly, on Tuesday, February 17, 1931, at 8 p.m. Tickets, which can be obtained from the club at Stag Lane, or the Royal Aero Club, 3, Clifford Street, W.1, are 18*s*. 6*d*. single, or 32*s*. 6*d*. double. The Secretary, Mr. M. P. S. Spencer would like to hear from any members who wish to make up parties at separate tables of 4, 8, or 10 persons. It is hoped to make the draw for the club raffle for three machines during the evening.

GROUND INSTRUCTION TO MEMBERS.—Since a large number of members have expressed a wish to receive ground instruction, the club has decided to start the following courses :—

(*a*) Two courses in Daily Maintenance, consisting of not more than six members, will be held daily from 8 a.m. to 10 a.m., and from 5 p.m. to 6 p.m.

The fees are £3 for one month, payable in advance.

(*b*) A three months' course in Daily Maintenance, Engines and Rigging. Daily attendance will be necessary, and not more than four members will be in the course at the same time ; two members on engines and two on rigging. The fee for the course is £15, payable in advance.

These courses will both commence on February 1, 1931, and members wishing to avail themselves of the facilities provided are asked to apply direct to Mr. M. P. S. Spencer, Assistant Secretary, London Aeroplane Club, Stag Lane, Edgware.

PHILLIPS AND Powis Flying School, Reading, will be closed for the Christmas holidays from December 24 to 30.

CINQUE Ports Flying Club again experienced very bad weather, which only allowed flying on three days of the week ending December 13. Members were, however, able to put in 13 hr. 45 min. flying, of which six members flew 5 hr. solo, a very excellent percentage. During the week, an epoch-making step was taken, when arrangements were concluded for changing over from the "X"-type Cirrus II Moths to modern Gipsy Moths fitted with slots. It is hoped that these new machines will be in commission during the first week in January. The club was closed for the Christmas holidays on Monday, December 22, and will reopen on Wednesday, December 31.

Don Bradman arriving by air at Essendon Aerodrome, Melbourne. The D.H.9 is the Australian Aero Club's advanced training machine, and the Moths are privately owned.

THE IRISH Aero Club started operations with their new Moth on December 6 at Baldonnel aerodrome. On December 13, in front of a large attendance at the club house, a draw was made for a free flight to Cork. Mr. P. Grimes, a Dublin solicitor, was the winner. Among those present was Capt. J. P. Saul, the navigator of the Southern Cross. There is evidently need for a strong cow-proof petrol pump for club use, since up to recently, they stored their petrol in a somewhat unstable shed. Now, however, this is a mass of ruins, following the efforts of a cow who scratched itself against the corner.

THE MUNICH Light Aeroplane Club was visited by many English private owners last year, and so the members have decided to return this courtesy by arranging for a formation of their club aircraft to fly to England next year.

NATIONAL Flying Services have revised their scale of flying charges. £2 10*s*. will now be charged for cross-country flying instruction. Navigational lectures beyond the standard for "B" licence pilots have also been arranged. The rates for solo flying have been modified so that members who have flown not less than 25 hr. during the previous 12 months may hire machines continuously at 30*s*. an hr. Below 25 hr. the rate is £2 per hr. 30*s*. per hr. will also be charged for flying by an N.F.S. pilot on members' own machines. Besides piloting, members may also qualify for ground engineers' licences and as aircraft engineering apprentices in the workshops at Hanworth.

Two of the Singapore Club's Moths (Cirrus II) landing in formation when Sir Geoffrey Salmond was visiting the Club.

GLIDING

GLASGOW Gliding Club.—The development of the club has been rapid, owing to the great enthusiasm of the members who have joined. Mr. Lowe-Wylde recently gave a lecture on gliding at St. Andrews Hall, Berkeley Street, before some 250 people. Following this, a private (Pathéscope) film was shown of the club's flying on their first practice day. After the lecture, Mr. Lowe-Wylde offered to answer questions, and the keenness of the members was shown by the way in which they took full advantage of the opportunity. On Friday, December 12, the first of a series of short instructive talks was held at the club house. The work has been growing steadily, and on November 30 gliding commenced at 12.30 p.m., and some 54 glides were made. The site at present used for practice is at Barrance Farm, Easter Whitecraigs, Glasgow, and gliding will commence at 11.15 a.m. every Sunday until further notice.

KENT Gliding Club held a very successful club dance at Maidstone on December 12. The British Aircraft Co. presented prizes for the best fancy dress, and the large number of members and friends present enjoyed themselves so much that it was decided to hold another similar dance in the future. On December 14 they were lucky in having a fine day, and it was possible to put in a large amount of training gliding at Lenham.

SOUTHDOWN Skysailing Club had a very busy day on December 14, some 50 glides being made from their site near Ditchling Beacon. Two more "A" certificates were obtained, and in spite of the light wind, Mr. E. K. Robbins made two timed glides, one of 41 sec. and the other of 40 sec. Flt.-Lt. Wood also qualified with a 32 sec. glide and thus added a fourth pilot's ticket to those he already holds, since he is qualified to fly aeroplanes, balloons and airships.

The Soaring Trophy presented to the British Gliding Association by Lord Wakefield.

NORTH KENT Gliding Club.—It is with great regret that we hear of the death, after a very short illness, of the Hon. Sec. of the club, Mr. Walter G. Davies. Mr. Davies had been Secretary of the club since its inception, and his enthusiasm and efforts have been responsible for its rapid progress. As a mark of respect, the usual gliding meeting was not held last week-end.

SCARBOROUGH Gliding Club.—A rally and inter-club contest will be held at Flixton Hill, near Scarborough, on Boxing Day, December 26, and the following days, 27 and 28, from 11 a.m. to dusk. The contests arranged will include the Longest-Distance Flight and the Greatest Number of "A" Gliding Pilot Certificates gained by any one club. Cups and medals have been provided as awards for the various events. In the evening of Boxing Day a ball will be held in honour of the visiting clubs at the Royal Hotel, tickets for which, including supper, are 5*s.*, and may be obtained from all members of the Scarborough Club, or at the Royal Hotel. The club only started this spring, and has since made really very great progress. At the beginning, practice was started on one R.F.D. Zögling, then a very bold policy was followed, and Herr Magersuppe, who came over here during the summer, was taken on as the club's instructor. With his advent a two-seater glider was obtained, and besides instruction in the ordinary Zögling, Herr Magersuppe gives instruction in this two-seater, and also lectures at the club's headquarters. The site at Flixton is an excellent one. The slope rises in a series of three humps. A novice can therefore be launched from the lowest hump, and as his confidence increases can be taken higher, until he reaches the summit, which is some 400 ft. high. From the top, Zögling flights of 2 to 3 min. have been made, while in the Prüfling and Professor type, it is possible to soar along the slopes for many miles. Besides meetings at Flixton, demonstrations have been given at Scarborough Castle Hill, Ravenscar, Sutton Bank, Barrow - in - Furness, Accrington, and many other districts. Further demonstrations will be given in the near future at Newcastle and Edinburgh. The club is always pleased to see members from other clubs, and any of those who wish to arrange joint demonstrations should write to the Secretary, Chairman, or Demonstrations Manager, at the Royal Hotel, Scarborough.

SOUTHAMPTON Gliding Club.—This is a new club, which has recently been formed, and great progress has already been made. A primary Dickson glider has been obtained from the Cloudcraft Co., and it is hoped to commence flying early next year. The club gliding ground is at Wide Lane, Swaythling, which is conveniently close to the town. The honorary instructors who have offered their services to the club are Messrs. S. P. Woodley and N. L. B. Puttock. Flying subscriptions have been fixed at 30*s.*, with an entrance fee of 10*s.* 6*d.* after the first 50 Founder Members have been enrolled. There will also be an associate member grade, with an annual subscription of 10*s.* 6*d.* Mr. L. W. Matcham has been appointed Hon. Sec., and those interested in the club should apply to him at 14, Cumberland Place, Southampton. Lt.-Col. W. E. Pittard is the Hon. Treasurer, and Mr. H. R. Goodall will be Joint Hon. Sec.

GLASGOW Gliding Club Meeting.—An extraordinary general meeting of the club was held in the smoke room of Rowans, Ltd., Buchanan Street, Glasgow, on Friday, December 12, at 8 p.m. Mr. Gregor Cameron was in the Chair.

The Secretary outlined the work already accomplished by the club and put before the meeting various plans suggested by the committee for the development of the club. In view of the necessity of increasing the club's funds it was decided to institute a ground fee for flying practice—the sum agreed to being sixpence for two flights.

Two films were shown to the members of gliders in action. One was taken on the first Sunday that our R.F.D. Primary Machine was flown at Barrance Farm. Considerable amusement was caused in that the various members could see themselves for the first time as others saw them. The other film showed a B.A.C. machine at work and it was interesting to compare the two different types of gliders. The films were shown by courtesy of Pathéscope.

A short lecture was given by Mr. J. K. Mackintosh on the "Theory of Flight" as it was felt that an appreciation of how the air forces acted on the plane would be useful to the *ab initio* pupils.

Later Mr. Houston Anderson dealt with the practical side of the question. He explained at length, with blackboard illustrations, how to fly the glider. His remarks being intended to supplement field instruction.

Quite a discussion arose over several points and it was obvious that these lectures were of very considerable value.

SOARING BIRD FLIGHT

SIR GILBERT WALKER, lecturing before the London Gliding Club, in the library of the Royal Aeronautical Society, on Wednesday, December 17, said that his experience started with regard to the investigation of soaring flight by birds in India, at Simla, some 7,000 ft. above sea-level. He was fortunate enough to be living in a position where, with the aid of a large telescope, he could see vultures and similar birds of prey rising from the ground, in which case he could look down on them and, for instance, actually see the top feathers of their wings flutter when the birds stalled, and their wings reached the burble point. He could also follow these birds as they rose to great altitudes. It was very interesting, he said, to watch such birds taking advantage of the uprising currents due to the heat as the sun rose and the ground got hotter and hotter. When one looked down upon them, one could see that they had to flap their way up from about 50 ft. to some 150 ft., and then the higher they rose the greater became the help they obtained from the uprising currents, until finally, they were able to soar without flapping at all, and at greater heights, on a really hot, clear day, you would see them soaring about without a movement of their wings for the whole day. On overcast days, when the uprising currents were not so strong, only kites and similar birds were to be seen, while the larger ones, after one or two attempts, would retire to their trees again. Sir Gilbert showed, during his lecture, a large number of interesting slides, including birds like the Golden Eagle in Scotland, where it was easy to distinguish the short wing of the "high lift" type, as he called it, which, when the bird was in motion, were kept well forward with the tip feathers wide open. These particular feathers, he told us, acted in the same way as slots did on an aircraft wing. With regard to this, he made mention of a committee which has been sitting recently, on the question of "stalling," whose finding was, that aircraft should have larger tail surfaces and slotted wings. The wings of such birds of prey cannot be called highly efficient for soaring, but they were so for lifting purposes, since the birds gorged themselves, and then had to lift very great weights. This was why one never saw them soaring in places like India, unless conditions were entirely favourable. Very often, if one watched them on days when the up-currents were not very strong, it was possible to see them get into difficulties and often stall badly, in which case they would dive rapidly to recover flying speed. Another type of wing, such as that possessed by the Albatross, was the long, narrow wing, or fast type, as he liked to call it. Sir Gilbert then gave us a lucid explanation of the relative motion between a bird flying and the air in which it is moving, showing that it is only the relative motion between the two which counts, and not between the bird and the earth. He then gave many more details of the type and magnitude of the rising currents which will comfortably support a Vulture, and compared them with the rising currents obtained up such slopes as those to be found at the Wasserkuppe, where much gliding practice is carried out on the Zögling type of glider. He then proceeded to show a further series of slides taken at the Wasserkuppe, showing different types of gliders, both primary and high efficiency, after which he went on to some photographs of wild swans taken with a cinema camera, in which it was very easy to follow the motions of the bird's wings while flapping. He said that the tactics of the Albatross were totally different to those of a Vulture, inasmuch as the Albatross made use of variations in the wind's velocity for maintaining his height, while the Vulture had to rely on uprising currents. The Albatross has a flying speed of some 50 m.p.h., and turns into the wind when he is losing height, thus making use of the increased velocity to climb again. He can, therefore, only glide in a strong wind. The Vulture's flying speed, however, is only about 18 m.p.h., and he merely glides backwards and forwards over a more or less vertical rising current, which, generally speaking, carries him up at about 1½ m.p.h. Coming to a little more detailed explanation in the action of wings during flapping flight, he showed that when the wings were lifted up this was done at a very rapid rate, and the portion of the wing nearest the body remained comparatively still, while the outer portion drooped during the upward movement, thereby decreasing its resistance to this movement. On the downward stroke, the wing was almost flat, and it acted in this case very much as a glider. At this point, he showed a photograph of a flapping type of glider which has been developed at the Wasserkuppe. He said that he did not see any great future for it, since the minimum horse-power required was about two, whereas a man could only keep up a sustained output of about ⅛ h.p. Sir Gilbert then proceeded to dilate upon the wonderful work carried out at the Wasserkuppe, and enlarged upon the particular care with which every step is taken; for instance, he explained how, when a new machine is designed, a model is first of all built and flown before the full-scale machine; then the full-scale machine is sent off on short glides from level ground, before it is finally launched from the steeper hills. This method, he said, ensured complete confidence in their pupils and in their machines. He uttered a plea for us here to follow out a similar routine, and not to make rash ventures on untried machines, because one set-back would do an immense amount of harm to the movement.

Mr. Gordon England, in opening the discussion which followed, asked whether Sir Gilbert considered it possible for sailplanes to make use of the variations in wind speed in the same way. He said he would like to mention, in defence of this country, that the late Mr. José Weiss, one of the pioneers of gliding in this country, invariably made models of his machines to start with, and so great was the success which attended these models, that they found it necessary to attach a ticket to them offering a reward for their return, since, on some occasions, when launched from Amberley Mount, they travelled as far as six miles. He was glad, he said, to hear Sir Gilbert's plea for steady development without rash ventures. With regard to the flapping type of glider, he said, Weiss was also developing one, when his experiments were terminated by his regrettable death, in 1916. Finally, he said, he understood that many of the Germans, particularly Herr Kronfeld, thought that ascending currents were to be found over the sea at low altitudes.

Sir Gilbert, in answering, said that he had not actually seen the flapping machine himself. His information concerning rising currents over the sea was entirely confined to books, but as a meterologist, he could not see any possibility that they could be encountered. Among other questions raised was whether or not the Albatross made use of the turbulence of the air for gliding, to which Sir Gilbert replied that he certainly thought it did, but he was very doubtful whether the energy obtained from this turbulence would be enough to support gliders. It depended, he said, to a large extent upon the air-sense of the pilot, and he did not think that a pilot would develop this sufficiently under about 10 years' experience. The meeting, which was extremely well attended, closed with a vote of thanks to Sir Gilbert for his extremely interesting lecture.

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CORRESPONDENCE

[*The Editor does **not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.***]

AEROPLANE CONTROLS

[**2354**] Mr. Stevens' lecture, delivered before the Royal Aeronautical Society on "Testing Aeroplane Controls," and reported in your issue of November 14, brings up many interesting points. His remarks regarding instinctive control are especially so. Some of the earlier types of aeroplanes had more or less instinctive controls incorporated, though, from what I remember, this type was not exactly popular.

One particular machine I have in mind was the old Nieuport monoplane of 1911-12. This machine had the usual control stick, but for *elevator* and *rudder*, whilst the wing warping for lateral control was carried out by foot pedals, or a bar—I forget which. In some ways this type of control had its good points, but I seem to remember that at the time of the death of Capt. Lorraine and Sgt. Wilson at Salisbury Plain, in a machine of this type, suggestions were put forward that the accident may have been primarily caused by the peculiar system of control, as it was found that, at that time the Nieuport was the only machine so fitted, and it might have caused confusion to the pilot after being used to machines with the conventional type of controls.

I bring this to your notice as this peculiar control, and possibly the Nieuport itself, may not even be remembered, except by older readers of your paper.

Toronto, Canada, R. E. Nicoll.
December 1, 1930.

DESCENDING CURRENTS.

By E. HANBURY HANKIN, M.A., Sc.D.

[*Older readers of* FLIGHT *will remember many contributions from Dr. Hankin, but those who have more recently become interested in flying will like to know that Dr. Hankin has made a very intensive study of bird flight, especially in the East, and has observed the behaviour of birds more closely, probably, than any man living.*—Ed.]

THE dust-storms that occur during the hotter months of the year in certain parts of India furnish opportunities for studying descending currents of air.*

In strong sunshine, air heated by contact with the earth may suddenly rise, breaking through the layers of cooler air above it. The air rushing in from all sides, to fill the space left by the ascending current, forms a whirlwind. Especially when the movement begins, the inrushing air acquires a downward trend before beginning its upward course. At this stage, therefore, it strikes the earth and picks up dust. The whirlwind thereby becomes visible and deserves its descriptive name of "dust-devil."

Another mode of formation of ascending currents is more of the nature of deflection upwards of the wind over a small area than a pulling to a centre of air from all sides as happens in the making of a dust-devil. During the hotter parts of the day such ascending currents are constantly being formed. If a vulture enters one of these currents and glides in it without either gain or loss of height, it is clear that its "relative wind" must depend on two factors; first its horizontal movement ahead through the air and secondly, the upward rushing past it of the ascending current. In consequence, its relative wind does not lie in the direction of its flight, but makes an angle with this direction as indicated in Fig. 1. The bird trims its wing to its relative wind so that the leading edge lies on a lower level than the trailing edge. Vultures may often be seen with their wings thus disposed. A proof is thereby obtained that ascending currents are constantly being formed at times when the air is suitable for their soaring flight. Ascending currents sufficiently strong thus to visibly influence the soaring flight of vultures commence some two or three hours after sunrise and continue during the heat of the day.†

But we are now concerned with the larger ascending currents that lead to dust-storms. Such currents, in Agra where I observed them, are usually only formed in the afternoon. The ascending air, when it reaches a certain height, leads to the formation of a cumulus cloud because, by the effect of expansion and cooling, the water vapour it contains is condensed into minute drops which later may run together and form rain. The process of cloud formation and presumably also the ascent of the air may go on for an hour or more before the beginning of the dust-storm. This stage is illustrated in Fig. 2. One result of the ascent of the air is that there is a slackening of the wind velocity at C. This is the source of the proverbial calm before the storm. Also there is a tendency for the wind on either side to veer towards the developing storm.

At length the ascending air loses its upward velocity and falls back forming a descending current. How and why this happens is a matter outside the range of my observations. Probably it is by no means a simple process. Perhaps over the centre of the storm there is a conflict between ascending and descending masses of air. But, whether or not this is so, it is only at the front or advancing edge of the storm that the descending air has such force as to strike the ground and to raise the masses of dust that form the dust-storm. The air that strikes the ground rises again. There is a confused mixture of ascending and descending currents in the dust-bearing air. That this is so is proved by my observations of soaring birds. Cheels especially may be seen gliding in or near the masses of dusty air. When so doing they frequently show a curious form of instability that was described as "tail-jolting" in my book "Animal Flight." Since then observations made independently of dust-storms have led to an explanation of the phenomenon. Tail-jolting occurs whenever a bird leaves an ascending current for relatively still air. It is, therefore, due to the relative wind momentarily pressing on the upper surface of the wing. Consequently the frequent tail-jolting shown by cheels in the air of a dust-storm is a proof that they are flying under very difficult conditions in which they are exposed to rapid alternations of ascent or descent of the surrounding air.

Vultures when overtaken by a storm make no attempt to glide through it. After retreating in front of it for a short distance, they turn to right or left, and having reached the side of the storm they again turn and come back behind it to their usual haunts.

The above observations of the air disturbances accompanying dust-storms suggest certain questions that aeronautical authorities might well put to meteorologists:

(1) Does the air route from Karachi to Calcutta through Delhi and Agra lie in a part of India in which afternoon dust-storms are a matter of daily occurrence over hundreds of miles of country during the hot weather?

(2) Whether an air route from Karachi to Calcutta via Bombay and Nagpur would avoid the area where dust-storms are frequent?

(3) Whether thunder storms are likely to result in turbulent air movements similar to those of dust-storms and, if so, in view of the comparative rarity of thunder storms at sea, whether over-sea routes are not much safer than over-land routes for aircraft?

* A paper by me dealing with dust-raising winds and decending currents was printed in the Memoirs of the Meteorological Department of the Government of India some years ago.

† I owe this explanation of an apparent negative angle of incidence shown by soaring vultures to Mr. J. D. North, the Chief Aeronautical Engineer of Messrs. Boulton & Paul.

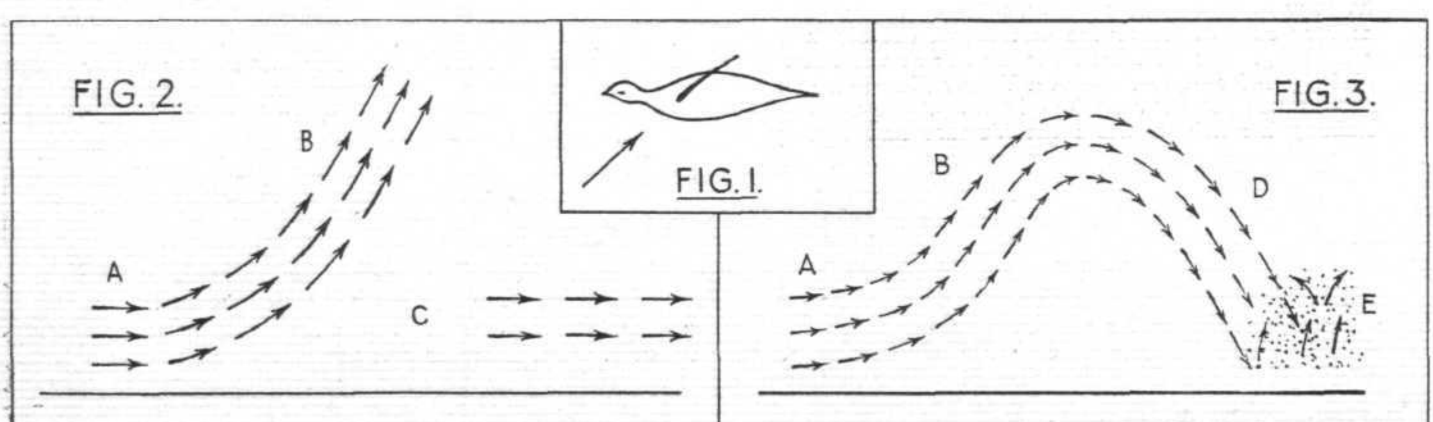

Fig. 1 is a diagram of a bird gliding horizontally in an ascending current. The arrow shows the direction of its relative wind. Fig. 2, first stage in formation of a thunderstorm or dust-storm: A is the prevailing wind; B, the ascending current; C, area in front of the storm in which there is a decrease of wind velocity. Fig. 3 shows second stage in formation of dust-storm: A is the prevailing wind; B, ascending current; D, descending current; and E, area of dust-storm.

AIR TRANSPORT

AIR MAIL SERVICES

The London Chamber of Commerce and the Postmaster-General

THE Postmaster-General received a deputation from the London Chamber of Commerce led by the President, the Lord Herbert Scott, on December 16, when various matters affecting air mail services and postal regulations were raised. Mr. Montague, the Under-Secretary of State for Air, and Mr. Bertram, Deputy Director of Civil Aviation, were also present.

The other representatives of the London Chamber were Sir Geoffrey Clarke, Deputy-Chairman of the Council of the Chamber, Colonel the Master of Sempill, Chairman of the Civil Aviation Section, Sir Robert McLean, Deputy-Chairman of the Civil Aviation Section and Mr. A. de V. Leigh, Secretary of the Chamber.

Lord Herbert Scott, in introducing the Deputation, stated that Great Britain must gain and retain the leadership both as a pioneer of aerial transport and as an aircraft manufacturing country, but in the present stage of development, air transport services could not be run without Government assistance. The Council of the Chamber had been very much disturbed to find that in the matter of initiating night flying transport services, other countries had been first in the field.

Colonel the Master of Sempill said that it was felt that purely mail-carrying air services were essentially matters which concerned the efficient discharge of the monopoly which the Post Office had for the carriage of mails and that, as in the United States, the Postmaster-General should be empowered to arrange for services, make contracts and, generally speaking, take all the necessary steps that will lead to the modernisation of British Mail Services. Although the policy of the Post Office was against establishing new services themselves, he thought that policy should be modified in view of the special conditions arising in connection with the creation of air mail services. The Chamber believed, he said, that satisfactory progress would not be made until the Post Office accepted financial responsibility for the provision of rapid air mail services.

In the United States there were already 14,000 miles of lighted airways, primarily provided for the use of air mails. He suggested that a portion of the huge surplus paid by the public to the Post Office for efficient mail services might be utilised to provide this modern facility which other nations enjoyed.

Sir Robert McLean referred to the fact that at present it took 6½ days in summer and 7½ days in winter for the Air Mail to reach Karachi from London, a distance of a little over 5,000 miles, which meant that in summer the average distance covered was about 28 miles per hour. The time saved over the surface route was only 7 days. The cruising speed of the machines now in use was about 85 miles per hour, and the low average speed over the route was due to the fact that passengers were carried as well as mails. Passengers could not yet travel by air at night, and therefore, as it was essential to adopt a 24-hour schedule, if full advantage was to be taken of the speed which the air could offer, it was suggested that over long routes passenger and mail carrying could not be combined with advantage.

Experience in America and on the Aeropostale air route from France to South America showed that 2,000 miles per day was no greater undertaking for an air mail machine, with routes lighted for night flying, whilst 1,000 miles per day was quite feasible even where there was no night flying.

Multi-engined machines, giving safety over any terrain, were now being built with a cruising speed of 125 miles per hour, carrying more than a ton of mail over a range of 800 to 1,000 miles. The Chamber believed therefore that, if steps were taken to organise sections of the route to India for night flying in both directions, a 3½-day schedule to Calcutta would be well within the limits of practical possibility. In fact, over the greater part of the route east of Cairo, flying conditions were better by night than by day throughout a large part of the year.

Sir Robert also alluded to the delay in completing the air route across India and beyond.

Sir Geoffrey Clarke said the Chamber desired to urge the introduction of ¼ oz. as the unit of weight for air mail letters instead of ½ oz. as at present, with a corresponding reduction in charge. The Chamber was satisfied that the present high initial charge of 6½*d*. was seriously curtailing the use of the service, and that even with an initial charge of 4*d*., which should be inclusive of postage and air fee, more than double the present quantity of mail would be carried by air. In fact, if the quantity were only doubled, the Post Office would stand to gain 1½*d*. in every ½ oz.: Imperial Airways, who were paid on the basis of so much per lb., would be in exactly the same position as at present, and the public would be given a very much cheaper service.

Sir Geoffrey gave the following figures, showing the remarkable growth of postal receipts for Air Mail carried by the French Aeropostale Company at a low initial weight in the last three years to South America:—1928—£22,500. 1929—£76,000. 1930—£160,000 (based on results of first nine months). Of this latter figure the amount derived from letters going out of England would only be about £7,500.

Sir Geoffrey also asked the Postmaster-General to give consideration to the possibility of changing the method of dealing with insufficiently stamped letters, which at present, if not properly surcharged, were put back for dispatch by the steamship route.

The Master of Sempill concluded the case for the Chamber by pressing for the adoption of suggestions put forward previously by its Civil Aviation section for the use of the stamp cancellation dies and posters on the Post Office vans for advertising the air mail.

The Postmaster-General, in reply, thanked the deputation for the suggestions put forward and promised to consider them. He wished to make it clear that this was a deputation to the Postmaster-General alone, and that the Under-Secretary of State for Air was present purely because the subject was one in which he was interested. This was important because a number of the points raised were matters for the decision of the Air Council, with which he, the Postmaster-General, had no concern.

He would deal first with some of the detailed suggestions. It was forbidden by International Regulations to send insufficiently prepaid letters by air, but a mutual agreement to waive this rule had been suggested to India, and a reply was awaited.

So far as the reduction of the minimum weight to ¼ oz. was concerned, while he would consider the proposal again, he felt it difficult to be enthusiastic about a suggestion which, in his view, was only of importance in the case of one service, and that not an Imperial service.

Turning to the question of the extension of the air service across India, the Postmaster-General said he must make it quite plain that the matter was solely for the Indian Government to decide, and that he had no concern with it whatever.

It had been suggested to him that there should be a faster service to India. This was primarily a matter for the Air Council, but, so far as the Post Office was interested, he could say definitely that reliability was of much more importance than speed so far as the posting public was concerned.

He wished, in conclusion, to say something about the main proposal of the Chamber—that was, the establishment of night-flying mail services to various places in Europe.

He doubted whether the development of civil aviation was such as to offer, at any rate for some time to come, the standard of reliability on which the Post Office must insist in the interests of its clients. Indeed, the information to hand indicated that—in winter, at any rate—even a 50 per cent. regularity was not to be looked for.

Secondly, the matter was clearly one for international co-operation, and not for any one country to deal with.

Accordingly, it had been considered by an International Conference which sat recently in Brussels. That conference had called for certain data which would be considered by another conference comprising all European countries, which was to meet in the autumn of 1931.

Thirdly, it was estimated that the network of services proposed would cost, roughly, £1,000,000 a year, which it was suggested should be paid by the Post Office.

He wished to stress the fact that aviation was not being developed solely for the carriage of mails, and it was for that reason that the function of subsidising it had been laid by Parliament, not on the Post Office, but on the Air Ministry. He personally had no intention of seeking the transfer of this duty to himself, and he proposed to maintain the view that the Post Office is, and must be, an ordinary customer of the air companies. It would be appreciated that the subsidies must be controlled by one authority.

Incidentally, the Postmaster-General remarked that, while offering no comment on the policy adopted by the U.S.A. in requiring the Post Office to subsidise air mails, whereas the British Post Office made a record profit of £9,000,000 last year, the American Post Office had a deficit of £13,000,000; the most recent figures available show a loss of £1,400,000 on air mails alone. He understood that the London Chamber was in favour of rigid economy in the Government service, and he could not quite reconcile their resolutions on the subject with their present proposals.

IMPERIAL AIRWAYS PROVINCIAL SERVICE

FOR three months last summer Imperial Airways, Ltd., operated an air service connecting Liverpool, Manchester, and Birmingham with Croydon. The service received substantial financial support from the three municipalities. It was run three times a week on alternate days. Despite the trade depression, the response was considered not discouraging. By starting at a reasonably early hour (a man in one of the northern cities did not need to get out of bed before 7 a.m., which is no hardship in summer) it was possible for a passenger to catch the early air service from Croydon to the Continent. This would certainly be more agreeable than travelling down to London by night train, and arriving in the very early morning before anything was awake in London. It was expected that the easy connection with the Continent would prove a great attraction to the business community of the Midlands and north, but it proved that the majority of passengers only flew as far as London, and of the rest, few patronised any cross-Channel service except that to Paris. Of the three cities, most passengers left and arrived at Birmingham, while Manchester came first in respect to freight and luggage. The following table, drawn up by the Manchester airport special committee, is interesting.

Passengers from	June.	July.	August.
Manchester ..	17	40	41
Birmingham ..	31	43	49
Liverpool ..	10	32	31

The passenger traffic northwards was much less. In August, for example, Manchester received 18, Birmingham 29, and Liverpool 12. In the same month Manchester received 684 lb. of freight and excess luggage, Birmingham 4, and Liverpool 48.

In all, 600 passengers were carried at fares slightly above first-class railway fares. The total freight carried was about half-a-ton. Only 30 passengers flew on to the Continent.

Imperial Airways has made a report on the results of the service and has submitted it to the cities concerned. If they should desire it, the company is willing to operate the service again next summer, but in that case it holds that the service should be made a daily one. A service on alternate days is not convenient to business men, and is of little use for mails.

It is also suggested that an extension to Belfast would make the service more useful. Imperial Airways has some experience of running a service between Liverpool and Belfast with "Calcutta" flying-boats. The chief obstacle to its success was the rise and fall of tide on the Mersey. A condition of undertaking such a service again would be the provision of suitable water for landing, taking off, and especially for mooring, in the vicinity.

There has been some talk of Glasgow desiring to enter into the scheme, but at present no plans for extensions to Scotland have taken any definite shape.

Combined Air and Rail Travel

NEXT year a system of co-operation between railways and Imperial Airways will come into operation. It will apply to both parcels and passengers. Parcels will be received at railway stations and can be booked through to the Continent by rail and air. Passengers will likewise be able to book through in the same way. In the rare event of an aeroplane making a forced landing, the passengers will be able to get on to a train at the nearest railway station, as the crew of the machine will be provided with voucher passes. Railways have acquired legal powers to run their own air services, but there is no likelihood of their doing so. They find it much more convenient to come to an arrangement with Imperial Airways, which has the experience and the facilities which it would take the railway companies a long time to acquire.

An Air Service to the Isle of Man

IT is reported that a Manchester-Manxland Airway will be opened definitely in the spring. Amphibian machines will be employed on the route which will be operated from the Manchester airport at Barton, by Northern Air Transport, Ltd. There will be three machines a day in each direction —from Manchester at 9.5 a.m., 1 p.m., and 4.10 p.m., and from the Isle of Man at 10.30 a.m., 12.35 p.m. and 7.55 p.m. Parties of 4, 6, or 8 would be conveyed at cheaper rates. Intermediate calls will be made on some trips at Liverpool, Southport, and Blackpool. The Manchester to North Wales service will also be put into operation about the same time, and at a later stage it is hoped to establish a regular service with Ireland.

Another Municipal Aerodrome

WE recently had an opportunity of looking over the site for the new Portsmouth municipal aerodrome. Work has already been started, and we were fortunate enough to be taken over the ground by Mr. Hunter, of Chester, who has been given the colossal job of transforming this portion of the rough surface into an aerodrome. That he will succeed in doing so, in the same way that he has done at the Great West Aerodrome (Heathrow), recently completed for the Fairey Aviation Company, we do not doubt, but at first glance it appears to the layman an almost impossible task. The site is 280 acres in extent and not only will Mr. Hunter have to cope with fields in various stages of cultivation and a large area which until recently has been allotment gardens, but also large ramparts, embrasures and bastions which form part of the fortifications facing Langstone Harbour, presumably erected in Napoleonic times. We understand that at present the work is being done in two halves and that Mr. Hunter, as we saw, has already started on the first half. The second half which will form the basis of the second contract, will include not only a great deal more in the way of gun emplacements, but also a moat of about a mile and a-quarter in length, by some 200 ft. wide. When finished, or, as has already become the common expression, when Hunterised, this aerodrome will surely be one of the finest in the country, and we sincerely trust that the foresight of the Portsmouth Council in allotting £129,000 for this work will be amply repaid in the years to come.

It is interesting to know that many local Councillors considered that three years would elapse before aircraft could land on the ground, yet Mr. Hunter and his pilot flew down and landed on a prepared portion exactly one month from the start of the work.

Dublin Municipal Aerodrome

IN the report of the Marine Lake Conference, held in Dublin recently to discuss the building of a Blue Lagoon Lido, on the North West side of Dublin Bay, the engineers recommend the draining and levelling of sloblands near the site of the Lido for use as a municipal aerodrome. The Marine Lake, which will be enclosed from the sea, is suggested as a landing-place for seaplanes. The sloblands mentioned occupy an area of about 150 acres, and it would require a large sum to drain, level and equip an aerodrome on this site. This scheme is the second in which Dublin Bay figures as an airport. The other, by Mr. Delap, was reported in our columns recently.

ORIGIN AND DEVELOPMENT OF HEAVY OIL AERO ENGINES

THAT two lines of advance are being pursued by the Air Ministry in the development of heavy-oil aero engines, one employing direct spray injection, and the other sleeve valves and organised air swirl, was revealed by Mr. D. R. Pye, M.A., F.R.Ae.S., in his Akroyd-Stuart Memorial Lecture to the Royal Aeronautical Society on December 11. The lecture was the first to be delivered under the Akroyd-Stuart foundation, and Mr. Pye, who, as most of our readers will know, is Deputy Director of Scientific Research, very properly devoted the first part of his lecture to the history of oil engines in general, and to tracing the claims of Akroyd-Stuart and Dr. Diesel as originators of the heavy-oil internal-combustion engine. Space does not permit of referring to this part of Mr. Pye's lecture in detail and we must confine ourselves to recording that Mr. Pye saw in the inventions of Akroyd-Stuart the work of an ingenious and very practical man, bent upon improving engines as he knew them, step by step. The Patents of Dr. Rudolf Diesel, on the other hand, revealed a man whose ideas were derived from sound theories, but no practical experience, which ranged far beyond any engine of his day. Dr. Diesel unquestionably visualised the introduction of the fuel *after* compression, and its ignition by the compression heat of the air only. Dr. Diesel also realised the fuel economy which would result from cooling the gases after combustion by using a large expansion ratio.

Parts II and III of Mr. Pye's lecture were devoted to an introduction to the fundamentals of the working principles of high-speed heavy-oil engines, and the lecturer pointed out that the airship, owing to its great range of flight, is the type of aircraft which stands to benefit most from the heavy-oil engine.

Mr. Pye divided the heavy-oil engine into three main types, in accordance with the system used for mixing the fuel and air properly: Direct fuel jet penetration through the combustion space; cylinder heads with a small "pre-combustion" chamber; and cylinders using an "organised air swirl."

The next section of Mr. Pye's lecture dealt with the research work carried out on single-cylinder units at the R.A.E., Farnborough, using the directed fuel spray method. From these researches were developed the Beardmore engines fitted in R 101. An important difference was that whereas in the Farnborough experiments fuel injection was controlled by a mechanically-operated valve, in the Beardmore engines a "jerk pump" system was used. The use of cylinders with pre-combustion chamber was not regarded by the lecturer as holding out much promise for aero engine work. The third method of fuel mixing, by an organised air swirl, was due to the work of Mr. Ricardo. Two important advantages of this method were: the low pressure required in the fuel system, and the absence of the very fine holes, ten to fifteen thousands of an inch, necessary with the direct-spray method. Two single-cylinder units used for research by Mr. Ricardo had given good results, the older unit running at 1,300 r.p.m., and the later model at 2,200 r.p.m.

Practical Developments

Mr. Pye then referred to the three different heavy-oil engines which have reached a stage of practical development: The Beardmore, the Junkers, and the Packard. The Beardmore, as is well known, is an 8-cylinder, in line water-cooled. The Junkers is a water-cooled 6-cylinder double-piston engine, and the Packard a 9-cylinder radial air-cooled. The Beardmore runs at 900 r.p.m., the Junkers at 1,500 r.p.m., and the Packard at 1,950 r.p.m. The maximum cylinder pressure allowed in the Beardmore is 850 lb./sq. in., and in the Packard over 1,200 lb./sq. in. All three engines have piston speed in the neighbourhood of 2,000 ft./min. The weights per h.p. for the three engines were given by the lecturer as 6·9, 3·08 and 2·26 lb. respectively, but he explained that the weight of the Beardmore was due, partly to the 8-cylinder in-line arrangement, but even more to the use, made advisable through troubles with torsional resonance, of a steel crankcase. When light alloy crankcases were used, and the engine run at a higher speed, with greater output, he thought the weight would come down to about 4 lb./h.p.

In the Junkers engine the two-stroke cycle was used, and good scavenging was fairly easily obtained by the use of two opposed pistons in each cylinder. The difficulty was to co-ordinate the power from the two pistons. In the Junkers heavy-oil aero engine the two crankshafts were geared together, a bold step in view of the large torque variations per revolution.

The main interest in the Packard engine lay in the combustion conditions in the cylinders, and in the great ingenuity exhibited by the detail design. Low weight and low consumption had been achieved at the expense of very high maximum pressures in the cylinders. He thought that from a research point of view, the British practice of limiting the maximum cylinder pressures to about 700 or 800 lb./sq. in. was right. The lecturer thought it possible that the dangers of high pressures had been overstressed, especially in high-speed radial types, since here the load on the crank pin bearing was largely relieved by high inertia forces. There was little weight wasted in a petrol engine at a weight of 2 lb./h.p., and Mr. Pye found it difficult to believe that comparable reliability could be achieved in a heavy-oil engine of the same type, and nearly of the same weight, in which the ratio of maximum to mean pressure was 14 or 15 to 1, instead of 4 or 5 to 1. He hoped that reliable information concerning the Packard in service might soon become available.

Future Progress

Turning to the future, the lecturer pointed out that, in addition to the three types of engine described, and which marked the present points of departure, there was the sleeve-valve type of heavy-oil engine. This was based upon the single-cylinder research work done by Mr. Ricardo. At present experience was lacking concerning the scantlings necessary in aero engines, but in heavier stationary engines the sleeve valve had proved its reliability. If the sleeve valve proved mechanically satisfactory, it would open up a promising line of development for water-cooled engines. A B.M.E.P. of 90 lb./sq. in. had been developed up to 2,500 ft./min. piston speed, with a fuel consumption of 0·39 lb./h.p. per hour, which represented an increase of cylinder output of 26 per cent. over the Packard performance, but with maximum pressures not more than two-thirds as great.

Concerning the two new types of heavy-oil engines upon which they were now engaged, Mr. Pye said that both were of the 12-cylinder Vee type water cooled. One employed direct spray injection, and the second used the sleeve valve and organised air swirl.

The first of these engines, Mr. Pye said, was a Rolls-Royce "Condor" converted to work on the compression-ignition principle. The work was being carried out with the co-operation of Rolls-Royce, Ltd., and although a good deal yet remained to be found out about it, he thought they would like to know that the engine had maintained a steady output at 1,900 r.p.m., for a net weight of 1,430 lb.

The sleeve-valve, organised air swirl engine was also based upon a Rolls-Royce petrol engine, the "F" type. This engine, built by Mr. Ricardo in co-operation with Rolls-Royce, Ltd., would, he hoped, be running early in the New Year.

Turning to more remote developments, the lecturer said that speculation naturally turned to the possibilities of two-stroke operation. Scavenging difficulties, such as those met with in the two-stroke petrol engine had disappeared; end-to-end scavenge seemed essential for adequate clearing out of waste products, and in the Junkers engine this was achieved by the use of two pistons. Two other possibilities appeared to exist: sleeve valve cylinders with two belts of ports, or cylinders with exhaust valve in head and scavenge ports around the base. The two-stroke heavy-oil radial engine was promising because the high maximum pressures would relieve the high inertia forces and so lighten the big end loads. For the development of the double piston two-stroke the only alternative appeared to be the double "swash-plate." The practicability of such an engine depended mainly upon whether the friction loss and heating of the oil between the swash-plate and pads could be kept down to about the same fraction of the engine power as in the familiar crankshaft-connecting rod mechanism.

The lecturer thought that organised air swirl before and during combustion would come to be more and more regarded as of vital importance. Before the ideal of the heavy-oil engine to burn 100 per cent. of the air in the combustion space could be realised, the problem of organised air movement would have to be studied more intensively. It was likely to prove a more profitable line of advance than refinements of fuel jet and injection gear.

The possibilities of supercharging a compression-ignition engine were as yet almost unexplored, and forced induction gave promise of control over the air swirl. On the other hand, supercharging amounted essentially to an increase in compression ratio with no corresponding increase in the expansion ratio, and supercharging, while giving a better power/weight ratio, would be likely to spoil the outstanding fuel economy of the compression-ignition engine. Under the

cruising conditions the situation was different. As power control was by reduction of fuel, it should be possible to burn the fuel in an efficient manner, and the supercharged compression-ignition engine should afford great possibilities in economy and power/weight ratio under cruising conditions.

In opening the discussion, Mr. C. R. Fairey said that he would like to know something about the comparative reliability of the three engines mentioned by the lecturer, and how this was affected by the specific weights of the engine. Also, what other factors affected reliability.

Mr. Wimperis, Director of Scientific Research, expressed appreciation that Mr. Pye had put the relation between Akroyd and Diesel in a definite and correct manner. He thought the prospects for obtaining a satisfactory heavy-oil engine for use in heavier-than-air aircraft were very good, and they were very largely due to Mr. Pye, Mr. Ricardo, Rolls-Royce, Ltd., and the R.A.E.

Mr. Ricardo said he would like to recall the great work done at the M.A.N. factory at Augsburg, Germany. It was really there that the cycle originated by Diesel was developed. Mr. Ricardo also paid a warm tribute to the work done at the Royal Aircraft Establishment at Farnborough.

Major Bulman said he thought the Beardmore could really be called a reliable engine, since it had done its 100-hours' type test and had run 225 hours at full power. He knew it was heavy at present, but the weight could not be got down. He would also like to mention again that a reverse gear had been incorporated without adding extra weight.

Wing-Commander Cave-Browne-Cave said he would like to point out that the speed figure given in the lecturer's table for the Beardmore engine should be 900 r.p.m. There was much to be gained by getting higher B.M.E.P.'s than now used, and he felt that the way to do this was by organised air swirl as developed by Mr. Ricardo.

"THE AIRCRAFT MANUFACTURERS ARE PLEASED"

A REPRESENTATIVE gathering of aircraft manufacturers expressed its vociferous approval of the Aeroplane and Armament Experimental Establishment at Martlesham Heath last Friday, December 19.

Some eight years ago, Grp. Capt. Gill instituted the first Martlesham Dinner to Members of the S.B.A.C., that is, a dinner which was held primarily for the purpose of welcoming members of the Aircraft Trade and of establishing closer contact between them and the staff at Martlesham. Just how well such personal contact was established is now past history, but for those who have perchance missed the previous reports of these dinners we may mention that it is on record that the Doctor has more than once been kept busy repairing the constructors where such contact had been too direct.

Grp. Capt. V. O. Rees, who is the present C.O., made a speech of welcome to the guests and said that after one of the previous years a report of the dinner appeared in the technical, press entitled "Martlesham is pleased," a very proper spirit, he said, but if he was to believe what he had heard said about Martlesham recently, it would appear that they had justified themselves since the aircraft trade was now pleased with them.

Martlesham, he said, had never had a more distinguished gathering at any dinner than they had on this occasion, for not only were all the leading aircraft manufacturers represented, but they also had, with them, Air Marshal Sir John Higgins and Air Commodore F. V. Holt, Director of Technical Development. Sir John Higgins had been their chief until recently, and they all regretted his retirement.

Grp. Capt. Rees intimated that they were very honoured to have such guests on these occasions.

Mr. C. R. Fairey on behalf of the guests felt that he should have had notice that he was required to undertake the onerous duty of representing the aircraft trade. He pointed out that if his presence was justified at all, it was as President of the R.Ae.S., and that he felt Mr. Handley Page, as President of the S.B.A.C. was shirking his duty.

He was, he said, buoyed up as Mr. Handley Page had offered him 5 per cent. for every mention he made of slots.

He had asked Mr. Handley Page what was the real excuse for slots, and the reply given him was that the C.G. of the "aeroplane" always goes back! This information was given with a request not to mention it as the Editor of a well-known technical paper might take it as a personal matter!

Mr. Fairey said that when these dinners were first instituted there was a lot of opposition on the grounds that they might lead to corruption of both parties. He was glad, however, to say that the spirit of camaraderie which existed at Martlesham could but do good.

When one came there one was always welcomed, but when a visit was made to the other Establishment at Farnborough one was met with a blunt request for a pass! Martlesham, he said, was now looked upon as *the* unbiased authority of the world from whom they could always obtain a true account of the performance of their aircraft.

Sir John Higgins considered that he was even more ill-treated than Mr. Fairey, since he was now a humble member of the aircraft industry. By virtue of his previous position, however, he felt that he should have been at these dinners on the three preceding occasions, and he much regretted that he had been unable to do so. He could, he said, speak as one of them, and he would take this opportunity of thanking those who had served under him for the loyal support they had given him, and in doing so he wished to make particular mention of Mr. Stevens (Principal Scientific Officer).

He was sorry that he did not have time to come and say goodbye personally before he left, and he hoped that they would overlook his default.

Air Commodore Holt said that this dinner showed great enterprise for such a small station, and he thought that they were to be congratulated most heartily on the way they had done it. Such dinners, he said, ensured the personal touch and this was what was necessary; in his experience at the Air Ministry he had always found that the personal touch made things possible while the greater correspondence there was the more friction there was. He then referred to his recent visit to Paris where he had been appalled at the lack of equipment of the aircraft, none of which were complete in the view of the Air Ministry.

Mr. C. G. Grey demurred at having to make a speech since he considered that his job was to write for the amusement of those in aviation and not to talk. He had been told, he said, that the personal touch which had characterised the previous dinners was dying out, and that the doctor was never needed now; he, therefore, made an appeal for its resumption, but suggested that he, himself was safe from undue personal contact since he was an aged cripple. He agreed heartily that the approval of Martlesham was the Hall Mark of a good aircraft, but he expressed a doubt as to whether it would not be better if manufacturers of civil aircraft were allowed to market aircraft without that Hall Mark but always providing that they could obtain it if they desired.

Mr. Handley Page in his vehement rhetorical style said that he was not at the dinner as a representative of the people who through Government orders filched public money for their own good, but he was here to find out what was wrong and what were the rules which prevented aviation from going forward. He, amongst many other suggestions, thought that the Government might still see that all aircraft were properly equipped, but he felt that they should not hamper those who wished to travel by air and that all rules should be made simpler, in fact he could visualise a time when the "lion" of the "Aeroplane" would be seen lying quietly with the lamb of the aircraft industry since he would have no cause to say anything but nice things about those who made the regulations. In conclusion, he said he would like to thank Martlesham for all they had done for British Aviation.

Sir Robert McLean regretted that he had only been in aviation for some 18 months, but at least this fact enabled him to have an even more unbiased view of the benefit which Martlesham was to aviation. Martlesham was an establishment, he said, from which one could always get the truth about aircraft, and he had very soon realised that their work was absolutely invaluable to the aircraft trade.

Mr. John Lord felt himself much out of place amid the array of white ties which he said, did not allow him to feel so much at home as had the more sombre garments of some of the former dinners, but this did not prevent him from treating the assembly to several of the Lancashire stories for which he is, one might almost say, famous.

"Personal Contacts" were then formed in profusion, and so ended yet another of the Martlesham dinners which has done so much to foster good feelings between the Service and the Trade.

We wish that both space and the proprieties allowed us to report the speeches more fully; Mr. Handley Page in particular is a man to whom no one can do justice on paper, but such notes as we have been able to publish will suffice to show that the speakers justified their reputations.

THE ROYAL AIR FORCE

London Gazette, December 19, 1930.
General Duties Branch

The following are granted short service comms. as Pilot Officers on probation, with effect from and with seny. of Dec. 5:—B. A. Casey, W. Dunne, E. R. S. Johnston, K. Lea-Cox, H. W. Marlow, A. H. Marsack, W. Pickersgill (Sub-Lt. R.N.R.), M. Sorsbie, H. L. Tancred, J. R. Wemyss, E. W. Whitley, F. W. Yates (Sec. Lt., The Duke of Wellington's Regt., T.A.).

Lt. E. O. F. Price, R.N., is re-attached to R.A.F. as Flying Officer, with effect from Dec. 9, and with seny. of Jan. 12, 1925. Flight Lt. A. W. Bates is granted a permanent commn. in this rank (May 1). The following Pilot Officers are promoted to rank of Flying Officer:—S. J. H. Carr (Oct. 2); D. W. Smythe (Nov. 22); E. Coleman, D.F.M. (Dec. 17).

Lt. H. D. Smallwood, R.N., Flying Officer, R.A.F., relinquishes his temp. commn. on return to naval duty (Dec. 6); Flying Officer A. O. Simpson (Lt., R.A.) relinquishes his temp. commn. on return to Army duty (Dec. 8).

Medical Branch.

M. Pearson, M.R.C.S., L.R.C.P., L.D.S., is granted a temp. commn. as Flight Lt., with effect from and with seny. of June 1. (Substituted for *Gazette*, Aug. 26); Flight Lt. B. F. Haythornthwaite, M.B., B.Ch., is promoted to rank of Squadron Leader (Dec. 19).

Dental Branch

Major L. Somerville-Woodiwis, L.D.S. (Army Dental Corps), is granted a permanent commn. as Squadron Leader, with effect from Nov. 24 and with seny. of July 1.

Chaplain's Branch

The Rev. S. L. Clarke, M.A., B.Sc., is appointed Chaplain-in-Chief, and is granted relative rank of Air Commodore (Dec. 11); the Rev. J. I. Stuttaford is granted short service commn. as Chaplain (Church of England), with relative rank of Squadron Leader (Dec. 11); the Rev. R. E. V. Hanson, O.B.E., M.A., K.H.C., relinquishes the appointment of Chaplain-in-Chief and is placed on retired list (Dec. 11).

Memorandum

The permission granted to Sec. Lt. Barclay Shaw to retain his rank is withdrawn on his conviction by the Civil Power (Dec. 17).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

J. S. Sheppard is granted a commn. in Class A as a Pilot Officer on probation (Dec. 5); Flying Officer C. C. Clark is promoted to rank of Flight Lt. (Dec. 17); Flying Officer C. G. H. E. Lumsden is transferred from Class C to Class A (Nov. 9); Flying Officer J. A. Ingles is transferred from Class AA (ii) to Class C (Dec. 7); Flying Officer G. W. Smart is transferred from Class A to Class C (Nov. 10). The follg. relinquish their commns. on completion of service (Sept. 12).—Flight Lt. W. W. McConnachie, Flying Officer A. E. Pitcher, M.M.

Medical Branch

Flying Officer P. A. Carrie, M.B., is promoted to the rank of Flight Lt. (Dec. 17).

AUXILIARY AIR FORCE

General Duties Branch

No. 604 (COUNTY OF MIDDLESEX) (BOMBER) SQUADRON.—The follg. to be Pilot Officer:—M. F. Anderson (Nov. 4). No. 605 (COUNTY OF WARWICK) (BOMBER) SQUADRON.—The Rt. Hon. the Viscount Bearsted, M.C., to be Honorary Air Commodore (Dec. 16).

Chaplain's Branch

NO. 603 (CITY OF EDINBURGH) (BOMBER) SQUADRON.—The Rev. W. B. C. Buchanan resigns his commn. (Nov. 11).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders: C. F. A. Portal, D.S.O., M.C., to Air Ministry (D.O.I.) for Air Staff duties, 15.12.30. R. H. Peck, O.B.E., to H.Q., Coastal Area, attached to Air Ministry (D.O.I.), 15.12.30.

Squadron-Leaders: F. H. Laurence, M.C., to No. 3 Flying Training Sch., Grantham, 9.12.30. G. D. Nelson, D.S.C., A.F.C., to Home Aircraft Depot, Henlow, 6.12.30. W. H. de W. Waller, A.F.C., to No. 33 Sqdn., Bicester, 15.12.30. H. V. Rowley, to No. 56 Sqdn., North Weald, 15.12.30.

Flight-Lieutenants: C. Walter, to No. 2 Flying Training Sch., Digby, 11.12.30. T. G. Bird, to Sch. of Army Co-operation, Old Sarum, 8.12.30. G. N. J. Stanley-Turner, to No. 13 Sqdn., Netheravon, 10.12.30. W. Sanderson, to R.A.F. Depot, Uxbridge, 8.12.30. G. V. T. Thomson, to No. 100 Sqdn., Donibristle, 6.12.30. J. E. W. Bowles, to Armament & Gunnery Sch., Eastchurch, 12.12.30.

Flying Officers: I. G. E. Dale, to No. 47 Sqdn., Khartoum, 28.11.30. A. O. Moore, to Station H.Q., Heliopolis, 25.11.30. H. C. D. Hayter, to No. 24 Sqdn., Northolt, 6.12.30. R. C. Warner, to No. 30 Sqdn., Mosul, 10.11.30. C. Sarsfield-Sampson, to No. 84 Sqdn., Shaibah, 24.11.30. I. G. E. Dale, to No. 47 Sqdn., Khartoum, 29.11.30.

Pilot Officers: D. W. H. Heath, to No. 55 Sqdn., Hinaidi, 15.11.30. H. C. O'Loughlin, to No. 3 Flying Training Sch., Grantham, 5.12.30. J. G. Mansfield, to No. 9 Sqdn., Boscombe Down, 7.12.30. L. S. Lamb, to R.A.F. Depot, Uxbridge, 9.12.30. The undermentioned are all posted to R.A.F. Depot, Uxbridge, on appointment to short service commns., with effect from 5.12.30:—B. A. Casey, W. Dunne, E. R. S. Johnston, K. Lea-Cox, H. W. Marlow, A. H. Marsack, W. Pickersgill, M. Sorsbie, H. L. Tancred, J. R. Wemyss, E. W. Whitley, F. W. Yates.

Stores Branch

Flying Officer A. H. E. Frost, to Station Administration, Halton, 8.12.30.

Dental Branch

Squadron-Leader L. Somerville-Woodiwis, to R.A.F. Depot, Uxbridge, on appointment to a permanent commn., with effect from 24.11.30.

Chaplain's Branch

Revd. S. L. Clarke, M.A., B.Sc., to Air Ministry (Dept. of A.M.P.), on appointment as Chaplain-in-Chief, 11.12.30. Revd. J. I. Stuttaford, to No. 1 Sch. of Tech. Training (Apprentices), Halton, on appointment to a short service commn., 11.12.30.

NAVAL APPOINTMENT

The following appointment has been made by the Admiralty:—

Promotion

LIEUT. P. W. W. WOOTTEN (Flying Officer, R.A.F.) to rank of Lieut.-Commander (seny. Dec. 15).

CROYDON WEEKLY NOTES

THE weather recently has been completely hopeless from an aviation viewpoint, and, despite the increasing skill of experienced bad-weather pilots and the general advance in technical matters connected with fog flying, many services have been cancelled this week. The Main Hall is thronged with pilots and passengers mournfully gazing at the weather chart, which displays nothing, or almost nothing, but those depressing yellow rectangles denoting thick fog on almost every aerodrome in Europe. Whilst the cancellation of services is to be regretted, especially as passenger bookings have been high, it is well to remember that boat services have been considerably deranged also, and that the refusal of operating companies to take any risks can but have a favourable effect on the travelling public, and will certainly tend to increase passenger traffic in fine weather.

At present the fleets of the various companies are distributed all over the Continent, and some of our friends, the pilots, in various places are becoming apprehensive about their chances of devouring their Christmas fare in their own countries.

Private charter companies and joy-riding concerns are also suffering from weather depression as, although there are plenty of orders, it is impossible to execute them. One bright spot in the gloom, however, is that this period is very useful for overhauling flying stock for the spring, and workshops are busy even though the air has ceased to vibrate to the roar of the aero engine.

Mr. Gordon P. Olley has returned from an interesting busman's holiday in the United States, where he visited little old New York, Hartford, Providence, Boston, Buffalo, Niagara and Philadelphia, amongst other cities, flying to all these places in multi-engined machines such as Stinson Detroiters, Fokkers, Fords, and other types.

Mr. Olley was greatly impressed by his cordial reception in American aviation circles, and is loud in his praise of the thoroughness and efficiency of our aerial cousins. The average cruising speed of commercial aircraft was over 120 m.p.h. Brakes and tail wheels were universal, and, in fact, the only tail skids he saw were on the scrap-heap. He met our old friends Frank Courteney and Bert Hinkler, who were both in fine fettle, and he flew with the former on the 18-seater Curtis-Condor. The Americans, by the way, seem to have excellent wireless and splendid radio beacons with a range of from 200 to 300 miles, and these they make practical everyday use of, instead of playing about with them and getting no forrader.

Purely from the layman's point of view it is a little difficult to understand why, when several firms operate long-distance routes in Europe with short-wave wireless and fixed aerials, most people insist on sticking to trailing aerials. The use of fixed aerials would do away with many control difficulties, and pilots could communicate with the ground stations just when it is most vital to do so—that is, when weather conditions compel comparatively low flying, when, of course, the trailing aerial has to be wound in, and wireless communication consequently ceases. One firm operating to and from Croydon will, we understand, shortly adopt fixed aerials as standard, and it is to be hoped others will follow suit.

Owing to many cancelled services, this week's figures show about 253 passengers only and 24 tons of freight.

IN PARLIAMENT

Air Services Hull-Hamburg, etc.

Mr. Montague said, on December 3, in reply to Lt. Cmdr. Kenworthy, I understand that local interests in Hull are giving consideration to the possibility of establishing an air service between Hull and Northern Europe, and that such a scheme might lead to, or be combined with, further lines between Hull and the West. As regards offering an air-mail contract to any company inaugurating such a service no proposals for such a service have been received by the Air Ministry. I understand that a scheme for a link between Liverpool and Belfast is being considered by Manchester, and, as far as the Air Ministry are concerned, every possible advice and suggestion with regard to co-ordination between Hull and Manchester is being given.

Colonel Howard-Bury: Is there any possibility of a scheme between Liverpool and Dublin?

Mr. Montague: I think all these schemes depend very largely upon finance.

Indian Air Mails

Maj. Pole asked the Secretary of State for India if he will give give information in regard to the terms of the financial arrangement between the post and telegraphs department in India and the authority responsible for the carrying of the air mails from Karachi to Delhi, and the arrangement it is proposed to make with the same authority for the carrying of the air mails on from Delhi to Calcutta when that service is open.

Mr. Benn, on December 9, in reply to Maj. Poole, said the Government of India have entrusted the commercial management of the Karachi-Delhi section of the Indian State Air Service to the Posts and Telegraphs Department as a temporary measure until April 1, 1931.

West Indies Air Service

Dr. Shiels, on December 10, in reply to Rear-Admiral Sueter, said proposals for the establishment of air services in the British West Indies have been put forward by Atlantic Airways, Ltd. It is understood that the initial operation contemplated by the company is the establishment of a service connecting Trinidad with British Guiana, Barbados and Venezuela. Full particulars of this initial scheme have been communicated to the officers administering the Governments of the colonies in question, and we hope shortly to receive their observations on the company's proposals.

Transatlantic Air Service

Mr. Montague said negotiations for establishing an air service between Baltimore and Bermuda, with a view to the eventual extension of the service across the Atlantic via the Azores to this country, have for some time been in progress. The project is not exclusively American, and involves co-operation between British and American air interests.

Aircraft Orders

Lieutenant Commander Kenworthy, on December 17, asked the Under-Secretary of State for Air whether he will give particulars of the orders for 250 aircraft of a new type recently placed by his Department.

Mr. Montague: No such orders have been placed. The recent press statements that such orders have been given are not correct.

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No. 3 Squadron Reunion Dinner

The eleventh annual reunion dinner of No. 3 Squadron, R.F.C., and No. 3 (Fighter) Squadron, R.A.F., took place at the Trocadero Restaurant on December 5.

The Chair was taken by Air Chief Marshal Sir John Salmond, K.C.B., C.M.G., C.V.O., D.S.O., LL.D., Air Commodore C. R. Samson, C.M.G., D.S.O., A.F.C., Guest of Honour.

Forty-five members sat down to dinner. Several former Commanding Officers, including Air Vice-Marshal Sir R. Brooke-Popham, K.C.B., C.M.G., D.S.O., A.F.C., the first Commanding Officer, being present.

In a speech after dinner, the Chief of the Air Staff read messages of good wishes from old members who were unable to be present. These messages came from as far afield as Egypt and Iraq.

It was most unfortunate that Squadron Leader C. A. Stevens, M.C., the present Commanding Officer was unable to attend, owing to indisposition. There were so many wishes for his early recovery and return to the squadron that he is sure to be well again at an early date. Flight-Lieut. John Oliver, A.F.C., who deputised for Squadron Leader C. A. Stevens, M.C., spoke of the work of the squadron during the year. Speeches were also made by Air Commodore C. R. Samson, C.M.G., D.S.O., A.F.C., and Flight-Lieut. L. G. Nixen, the latter who, whilst serving with No. 3 (F) Squadron, was taken prisoner 13 years ago to the day.

Till midnight several impromptu turns were given and many "a line shot," the best of these being attributable to a certain Squadron Leader, who apparently flies "Southamptons," inverted.

At the conclusion of a very successful and cheery evening at the Trocadero a large party left for an unknown destination. The rumour that several members spent the night on the embankment is being investigated.

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IMPORTS AND EXPORTS

Aeroplanes, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see Flight for January 25, 1912.

For 1912 and 1913, see Flight for January 17, 1914.

For 1914, see Flight for January 15, 1915, and so on yearly, the figures for 1929 being given in Flight, January 17, 1930.

	Imports.		Exports.		Re-exports.	
	1929.	1930.	1929.	1930.	1929.	1930.
	£	£	£	£	£	£
Jan.	..2,852	2,987	74,307	147,935	100	—
Feb.	..6,532	2,460	195,369	226,049	2	1,000
Mar.	..1,210	744	204,664	156,098	90	802
April	..5,816	2,959	186,477	213,390	115	79
May	..4,706	11,706	243,549	158,460	1,245	2,550
June	..9,304	15,029	144,817	252,443	750	1,060
July	..6,961	14,216	139,695	170,594	—	938
Aug.	16,706	5,382	160,625	146,564	4	6,912
Sept.	.. 510	2,757	237,303	109,363	9,686	1,730
Oct.	..6,226	3,502	297,879	140,225	1,370	355
Nov.	..5,993	13,849	117,858	162,116	24,063	1,000
	66,816	75,591	2,002,543	1,883,237	37,425	16,426

PUBLICATIONS RECEIVED

No. 1247 (*Ae.* 401).—Tail Flutter of a Particular Aeroplane. By W. J. Duncan and A. R. Collar. May, 1930. Price 1*s*. 3*d*. net. *No.* 1310.—The Aeroplane as a Source of Sound. By M. D. Hart. May, 1929. Price 1*s*. 9*d*. net. *No.* 1322 (*M.* 68).—Further Experiments on the Behaviour of Single Crystals of Zinc Subjected to Alternating Torsional Stresses. By H. J. Gough and H. L. Cox. August, 1929. Price 1*s*. 6*d*. net. *No.* 1323 (*M.* 69).—The Behaviour of a Single Crystal of Antimony Subjected to Alternating Torsional Stresses. By H. J. Gough and H. L. Cox. November, 1929. Price 1*s*. 6*d*. net. *No.* 1328 (*E.* 38).—Performance of a Compression Ignition Unit with Reduced Intake and Exhaust Pressures. By P. H. Stokes. December, 1929. Price 1*s*. 6*d*. net. *No.* 1332 (*Ae.* 464).—Comparative Handling Tests of Three Bristol Fighter Aircraft with Different Types of Slots. By Flight-Lieut. C. E. Maitland and Flight-Lieut. J. H. C. Wake. October, 1929. Price 9*d*. net. *No.* 1333 (*Ae.* 465).—A Simplified Analysis of the Stability of Aeroplanes. By W. L. Cowley and S. W. Skan. March, 1930. Price 9*d*. net. *No.* 1335 (*Ae.* 466).—Photographic Records of Flow in the Boundary Layer. By L. F. G. Simmons and N. S. Dewey. May, 1930. Price 1*s*. net. H.M. Stationery Office, Kingsway, London, W.C.2.

The Welder. Vol. II, No. 9. *November*, 1930. Alloy Welding Processes, Ltd., Ferry Lane Works, Forest Road, London, E.17.

Transactions: Seventy-Fourth Session, 1930–31. The Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow.

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